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ABSTRACT

A project which involved an intensive search of the literature and contacts with individuals in the field concerning the dissemination of information about educational software is described. Included are an analysis of education software information available to educators, a needs assessment of Canadian educators, and the generation of an implementation plan designed to make the two more congruent. Problems inherent in the collection, organization, and dissemination of information about educational software are addressed, and a structure is suggested for effectively accomplishing these activities. The introduction to the report describes the research methods used and provides definitions of terms, a summary of the educational software situation, a definition of the problem, and an outline of the project. A summary of the research analyzes results related to (1) library and vendor cataloging; (2) indexing: library, print, catalog, ERIC, and PRECIS; and (3) delivery systems: decentralized versus centralized systems, MARC format, computers and library procedures, options, online databases, history of nonprint databases, FORMAT/UTLAS, and database design. A discussion of standard description includes problems, suggested fields, and sample display formats. An implementation plan and recommendations conclude the report. Thirteen figures are included, and a summary of the computer cataloging and indexing survey is attached. (LMM)

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EDUCATIONAL SOFTWARE:

A Canadian Plan
for
Information Sharing

(Phase 1)

VOLUME I

Joint Provincial Courseware Cataloguing and Indexing Project

Prepared for the MINISTRIES OF EDUCATION of:

ALBERTA
BRITISH COLUMBIA
NEW BRUNSWICK
NORTH WEST TERRITORIES
NOVA SCOTIA
ONTARIO

By JEM RESEARCH

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MATERIAL HAS BEEN GRANTED BY

W. Tennant

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

June 1982

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1.0 INTRODUCTION

A crucial obstacle to wider educational use of the computers is the dearth of information regarding adequate materials. In fact, the coordination of information in the field of educational computing is so poor that it is increasingly difficult to determine whether the "software crisis" now represents the real scarcity of good software or of information about existing material. A lack of documentation, validation and dissemination have been cited as factors contributing to the apparent scarcity. This lack of information is found in both administrative and instructional computing applications.

This project represents a coordinated recognition of and attempt to respond to a universal situation. The unusual complexity of the medium demands a more detailed analysis, both semantic and applied, of the components of the problem and the specific issues raised by each component. It is intended that the work will provide a coherent basis for subsequent development of an educational software database and delivery system.

1.1 Project Research Methods

This project involved consideration of a variety of disciplines including:

- Library Science
- Education
- Computer Technology
- Communications Technology

Extensive research in each of these areas was necessary in order to intelligently define and examine the original project problem. This research was initiated by a search of the literature with a focus on the following areas:

- on-line information retrieval
- cataloguing
- indexing
- computer retrieval
- library networking
- library automation
- software evaluation
- educational resources
- database management

(See Appendix III for a bibliographical review of documents, articles, books, etc. organized according to the above subject headings).

Comprehension and clarification of library, computer and educational resource terminology was essential for useful discussion of the various intellectual components of the project. A glossary of terms was generated and should be useful when reading the report. (See Appendix II)

Numerous field contacts with individuals and organizations (over 100 individuals, over 30 organizations, 11 departments of education) were made through a combination of visits across Canada, a plethora of phone calls and intensive communications by mail. The range of expertise consulted in this manner included:

- a) librarians experienced in cataloguing or organizing educational resources
- b) specialists in the field of computers in education (school and industry based)
- c) research organizations involved in the collection/dissemination/evaluation of educational resource material at the provincial and school level
- d) persons knowledgeable in the area of database management

(See Appendix I for a Contact Log.)

In addition to these initial contacts, further information was obtained from:

- a) prominent library technicians in advanced areas of library automation and networking
- b) publishers collecting or organizing education resources and/or computerized learning materials (See Appendix IV for examples of field formats)
- c) companies and individuals producing software suitable for maintaining a database (See Appendix VII for description of some Information Retrieval Packages)
- d) clearinghouses for educational software (See Appendix V)
- e) clearinghouses for educational resources (See Appendix VI)

Finally, as stipulated in the terms of reference for the project, examples of evaluation methods appropriate for educational software were collected.

(See Appendix VIII.)

The JEM Project Team is grateful to the many individuals and organizations who gave their time and expertise so willingly. The results of this research represent a collaboration of effort and concern by many different subject specialists who are committed to the general notion of information sharing.

1.2 Definition of Terms

Precise definition of terms is crucial throughout this discussion. Indeed, misuse of terms and a super-abundance of overlapping (or vaguely defined) terminology has been a particular problem during the course of this research. In the interest of clarity it is desirable, at this point, to select an appropriate label for the medium with which we are dealing. Figure 1 is a mini-glossary of related but distinct terms which could be and, (depending on the literature), are used to signify this medium. Included are terms which are of varying degrees of appropriateness and terms which are clearly inappropriate but which nevertheless add to the confusion.

The original terms of the project designated courseware as the focal point. A thorough examination of the problem suggests that educational software is a more appropriate object of study for the following reasons:

1. The former is a subset of the latter and specific treatment of the unique characteristics of courseware runs counter to the requirement for a flexible method. Flexibility suggests deriving a general method which allows for varying degrees of specificity.
2. The preponderance of materials, for microcomputers in particular, does not exist in courseware form (i.e. a complete course of study). Although some users are more interested in promoting the concept of courseware (i.e. Ministries), lessonware represents a large enough bank of materials that it must be addressed if the information problem is to be solved for all users.
3. The distinction between lessonware and courseware can be seen as a somewhat arbitrary one by some groups and this distinction is not recognized by all groups.
4. There is a sufficient bank of materials which straddles these two concepts (lessonware and

courseware) so as to make user distinction difficult.

Having labelled our medium as educational software, we can address the initial definition of our task. The original title suggests an examination of "cataloguing and indexing systems." It was only after a reasonable degree of understanding was achieved of the various disciplines involved (library, education, computers, automation) that the inappropriateness or vagueness of these terms (cataloguing, indexing, systems) became apparent.

"Cataloguing" (in the traditional library sense) for educational software is so little practiced at present that a survey of methods is not particularly useful. However, there is a proliferation of "catalogues" (in the vendor sense) which purport to describe educational software. There is a requirement for both types of cataloguing (i.e. a library record for software held in a library collection and a browsing list of available software for educators).

"Indexing" refers to a complex process of supplying access points in an automated system and, in this context, is more appropriately termed an indexing language. Librarians, however, think of indexing as a process which relates (for instance) periodical literature to subject designations of one sort or other.

A "system", to computer enthusiasts, suggests a combination of hardware and software used to accomplish a task. To the uninitiated or those with more traditional vocabularies, "system" means a method or way of performing a task.

Given this confusion of terms due to their relative applications, it was decided to take the liberty of interpreting the overall problem and redefining the task. This does not represent a redefinition of needs,

but rather a rewording and clarifying of same. "Cataloguing" and "indexing", in their broadest sense, suggest the organization and dissemination of information. "Systems" suggests a method (automated or otherwise) of accomplishing a task. Consequently, we feel that "organization and dissemination of information about educational software" represents a more workable and appropriate definition of the task at hand than "cataloguing and indexing of courseware".

This rewording is not based solely on a semantic examination of terms. It also arises as a result of careful scrutiny of the overall problem and needs as reflected in the existing situation which prompted the project and the terms of reference of the contract.

Figure 1

EDUCATIONAL SOFTWARE - A GLOSSARY

Computerized learning materials -

Educational resources which require computer hardware in order to be utilized. Hardware may range from a microcomputer to a mainframe.

Computer programs -

A set of sequenced instructions which cause a computer to perform particular operations.

Courseware -

The software and all the supplementary print materials that constitute a complete course of study. Thus, a courseware package might include a magnetic tape or floppy disk, a videotape, a set of microfiche cards, and a set of printed materials; analogous to the long sequences of content in subjects of study that are now produced as textbooks; a package (a program or collection of programs) and its accompanying literature. The first two definitions originate in Ontario and seem specific to that location, the latter is the more generally understood meaning.

Educational software -

Computer programs designed to be used in an educational, instructional, or training setting.

Firmware -

Software instructions or data that are sorted in a fixed or "firm" way, usually implemented in a ROM, PROM, or EPROM, as opposed to software programs stored on paper or magnetic media and which must be

entered into the RAM memory of the computer to be used. Firmware is built into the computer.

Hardware -

Refers to the physical equipment, the actual nuts, bolts and wiring, that makes up a computer. If a particular bit of data manipulation is handled by circuitry rather than by a program, it is said to be "in hardware".

Lessonware -

Is defined as short computer programs dealing with particular topics or short sequences of content within courses of study.

Machine-readable data files -

Data stored on a variety of media. A collection of related records that are treated as a unit and represented in such a way that they can be read or translated by a machine.

Non-print media/resources/material -

Materials which involve media other than the print medium. Many graphic materials are actually printed, but the term non-print has come to mean those materials which are not textual or book-like in nature.

Software -

The word software refers to a computer's programs. If a particular bit of data manipulation is done through a program rather than by special circuitry, it is said to be "in software".

Utilities -

A utility program is a program made available by the operating system to save programmers the necessity of writing their own programs to do often needed tasks.

1.3 Summary of Educational Software Situation

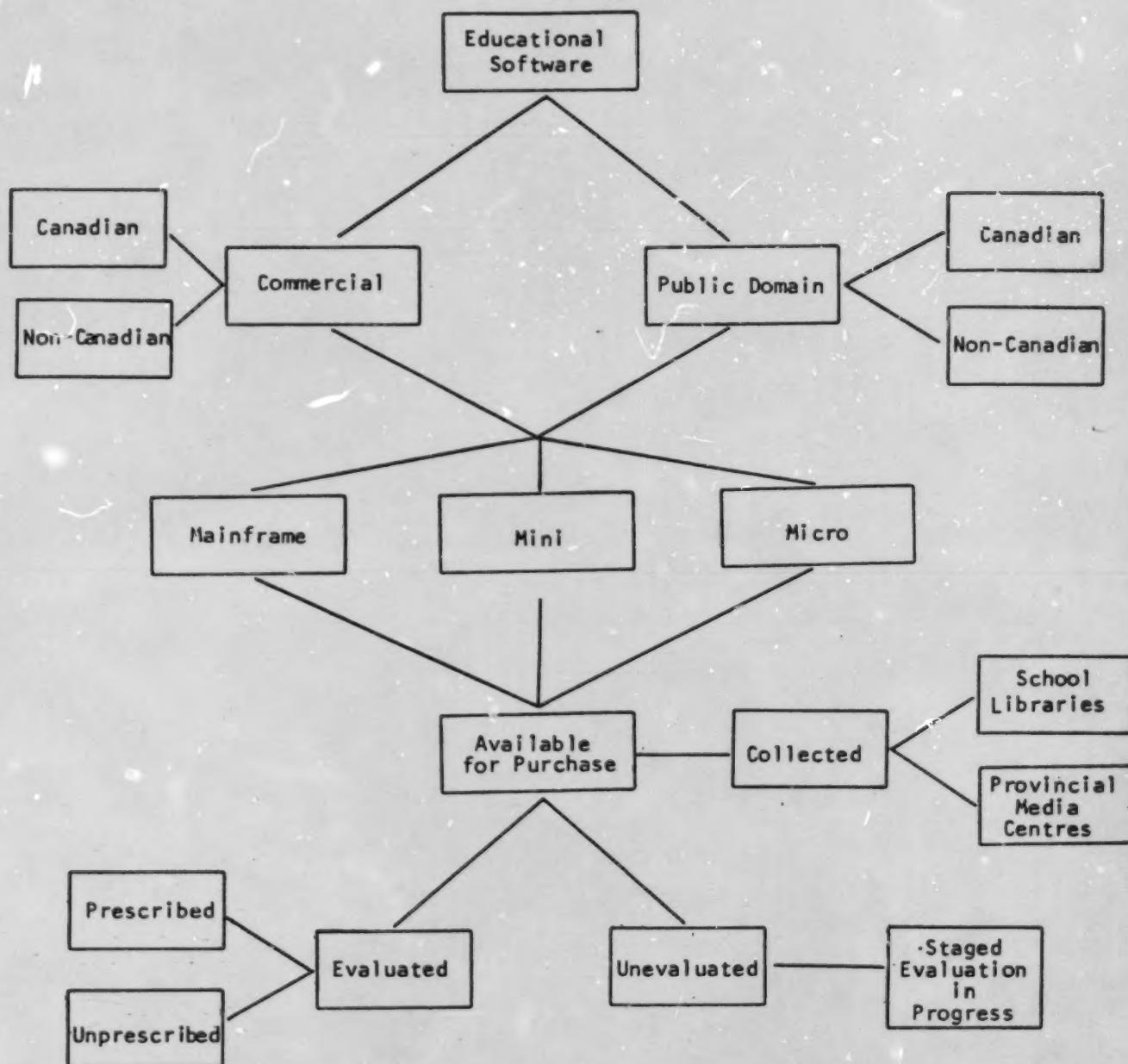
The educational software situation may be characterized by stating that there exists a proliferation of potential educational materials (software) authored by educators and non-educators; produced commercially and privately; distributed through complex or simple channels for sale or sharing (public domain). This material is of varying levels of quality, subject to little comprehensive and detailed evaluation and of unknown appropriateness to school curriculum. These characteristics are summarized in Figure 2.

Although various attempts have been and are being made to describe, organize and evaluate this material, no standardized methods exist and this work is usually carried out by organizations with limited funding and personnel. (See Appendix V for information about individuals and organizations active in this area). Much of this work is in experimental or planning stages.

This situation of unorganized information regarding a potential educational resource (of unknown quality and appropriateness) which abounds in great quantities (and is growing rapidly) is compounded by the fact that these materials are already in the schools - notwithstanding the information problem and the lack of board/district/division/Ministry direction or guidance.

This situation poses a number of problems to various members and levels of the educational community. Ministries of education are being pressed for direction, prescription, guidance and funding and recognize the need to evaluate and determine the appropriateness for curriculum of these materials.

School boards, districts or divisions are faced increasingly with requests for purchases and guidance from consultants about materials suitable for various



ADDITIONAL CONSIDERATIONS

- 1) Application - CAI, CMI, computer science, computer literacy, tutorial
- 2) Academic Level - elementary, secondary, post-secondary

Figure 2

POTENTIAL CHARACTERISTICS OF MATERIALS TO BE
INCLUDED IN A DATABASE OF EDUCATIONAL SOFTWARE INFORMATION

subjects, courses, and ability levels.

Teachers want to make intelligent selections of materials to complement their regular instructional program and need to integrate this material with other educational resources.

Resource and library personnel, although they may not currently be affected, will ultimately be faced with the task of collecting, organizing, disseminating, and maintaining this material and determining how to integrate it with existing collections and methods. In addition, they will be called upon to suggest appropriate material or to provide information which will aid in the selection of appropriate material.

Students of varying grades and abilities will want and need to access software to supplement or replace regular instruction, or for drill and practice or enrichment of concepts already taught.

Solutions to all of the above problems will require ready access to accurate and useful information and descriptions of specific educational software programs. One of the major complaints of users of educational software is that reliable and thorough information on available programs is difficult and time-consuming to ascertain. Most descriptions can be found in a variety of vendor catalogues covering software, (See Appendix V for examples of software catalogues) but efforts are not coordinated and coverage is far from complete. Library treatment or organization of this medium is limited.

The medium of educational software gives rise to an unusual number of problems for libraries (or any individual or organization attempting to describe this material). Any method of description has the difficult task of trying to cope with differently defined levels of complexity, language dialects, program structures, memory, system and peripheral requirements, requirements for lesson and classroom management, specific education and technical documentation, limitations of transferability, the capability of the software to be used when different systems are linked together (interfaced) and, finally, complex methods of distribution.

1.4 Problem Definition

Having defined our terms, and characterized the situation and the consequent problems posed to a variety of users, we may safely summarize the basic problem as the organization and dissemination of information about educational software. However, if the specific problems of various users are to be taken into account, we can see that a method or solution to the basic problem must:

- 1) allow for sharing - some measure of standardization is implicit
- 2) allow for individual difference in information requirements - flexibility required
- 3) provide efficient and quick accessibility - suggests automation
- 4) allow for interface with other educational resources (print and nonprint)
- 5) accommodate various organizational schemes for educational resources (local, provincial)
- 6) be workable now - suggests phased approach to any computerization or database of information.

The original problem definition can now be qualified and expanded upon to suggest: the organization and dissemination of information about educational software with a view to standardization, sharing, automation and interface with existing educational resources.

1.5 Disciplines Involved

In order to address the problem and its recognition of the need for standardization, sharing, automation, and interface it was necessary to investigate several distinct disciplines. Research revealed that each discipline harboured various issues with direct implications for our, as yet, undefined solution.

An examination of library standards revealed that procedures in school libraries, indicate a marked lack of standardization - especially in the realm of non-print materials. The library profession is currently undergoing a strong push for standardization, but this action is still taking place.

Mechanisms for sharing information demanded that the current state of communications be examined. Predictably, education networking and library networking are all actively affected by the increasing potential for computer networking. Each of these forms of cooperation represents a subject for further study.

Automation was apparent in numerous forms which have implications for this research. These include library automation, online information retrieval and database management technology.

Finally, the area of organization of educational resources revealed various issues regarding the treatment of print and non-print materials.

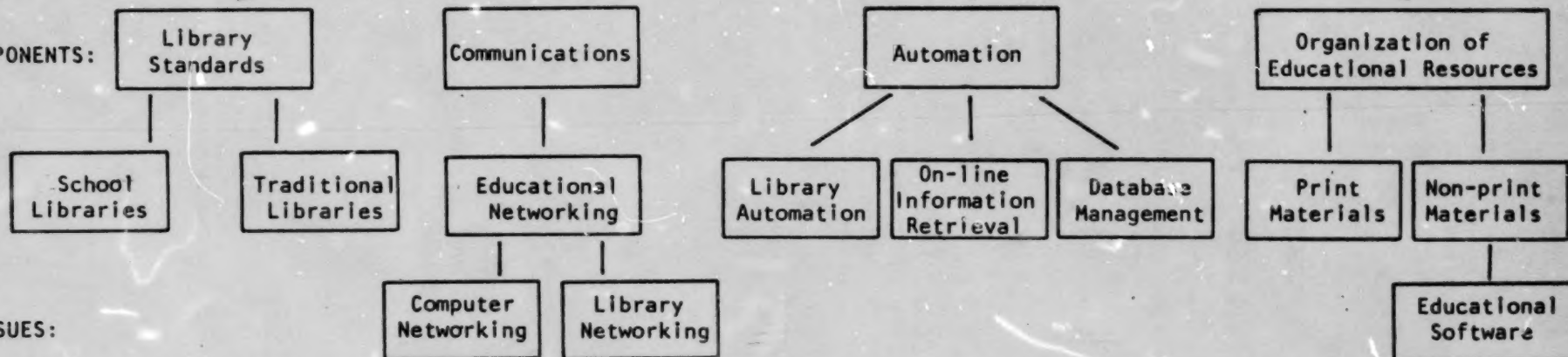
Figure 3 represents a chart summary of these issues.

Attempting to assess the "state of the art" of the issues was further complicated by the following

ORIGINAL PROBLEM:

Organization and dissemination of information about educational software with a view to: Standardization, sharing, automation, and interface with existing educational resources organization.

COMPONENTS:



ISSUES:

Figure 3

COMPLEXITY OF THE PROBLEM

interesting observations: all of these issues are intimately affected by computer technology in one form or another. The flux (rapid growth and change) of this technology makes "getting a fix" on these issues a frustrating if not impossible task for the experts within the fields, let alone a research group attempting to investigate some of these areas for the first time. The dynamics of this technology and its concomitant effect on these disciplines has served to add to the already considerable frustration.

This foregoing discussion serves to demonstrate the complexities inherent in the problem.

1.6 Project Outline

As is often the case, definition of the problem is more than half the task of providing the solution. Having carefully defined the problem posed by educational software to educators, certain solutions began to present themselves. The balance of this report presents suggested solutions and rationales based on extensive research and field contacts and will be structured in the following manner:

- a) A review of findings regarding the treatment of educational software, library methods, on-line databases and some comments about delivery systems;
- b) Suggestions for a standardized description for educational software. This section will summarize important considerations and problematical issues in the development of this standard, present a detailed discussion of suggested components of such a standard, and give examples of display formats for a standard description;
- c) A suggested plan of action for the establishment of an information sharing mechanism for educational software. The sequential plan will combine steps to be followed, recommendations regarding certain issues, and suggestions for further study. A tentative time and cost analysis of future work is also supplied;
- d) A collection of valuable information in the form of appendices. This information includes a contact log, glossary of terms, a subject index, examples of field formats, a list of clearinghouses for educational software and educational resources, a collection of materials about information retrieval packages suitable for database management, examples

of evaluation methods appropriate for educational software, and finally, examples of present applications of the PRECIS indexing method.

2.0 Summary of Research

The major thrust of this project was to assess the information requirements of users of educational software, determine how these needs are currently met and to suggest, if appropriate, an improved method of meeting those needs. Implicit in the purpose of such research is the understanding that current information requirements regarding this educational medium are not being met in a satisfactory manner.

The following summarizes current treatment of this material by libraries and other information organizations, as well as systems which might provide access to this information.

2.1 Cataloguing

The term "catalogue" suggests two concepts; the library catalogue, which describes documents located in a library and the vendor catalogue which lists products available for purchase. Both serve as selection tools - the former acquaints the user with documents available in the library and with classification information which helps the user to determine the appropriateness of each item; the latter acquaints the potential purchaser with items available for purchase and attempts to provide sufficient information to allow intelligent selection of materials to be purchased.

Educators concerned with educational software require catalogues in both senses - as a library tool and a purchase tool. The latter represents the more pressing of the two needs since collections in school libraries of educational software are minimal and in most cases non-existent. However, as the numbers of these materials multiply, collections will evolve and the library or resource task of organizing, describing, and maintaining collections will present itself. School librarians have little information and few guidelines for cataloguing this material and integrating it with other school resource materials.

Although both types of catalogues share certain descriptive features, there are some information requirements which are unique to each. These unique data elements are determined by subtle differences in users, purpose, and form of each catalogue. A brief discussion of each type of catalogue may be helpful.

2.1.1 Library Cataloguing

The information provided by the library catalogue helps the user to determine:

- whether the collection contains a specific item;
- which works by a particular author are in the collection;
- which editions of a particular work are in the collection;
- what materials a collection has on a specific subject.

Generalization about library treatment of educational software may be drawn from the present state of organization of non-print materials within schools. Most collections are ordered under some system of accession numbers. In order to identify an item meeting a particular need various classification and retrieval systems are used, all of which have advantages and limitations. The commonest method of search uses either a Dewey Decimal or similar classification system, or a subject index (usually Sears or Library of Congress headings) which may or may not be linked to an accession number.

In all too many cases, the system has fallen down over failure to provide full and comprehensive cataloguing cards. Information provided has tended to be very brief, indicating what medium the material is in, but rarely a satisfying descriptive comment.

Similar types of media are usually stored together, and frequently the classification system is also organized in the same way. This means that a user wishing to find material on a particular concept must consult several catalogues, card indexes, etc.

Cataloguing codes used in school libraries for

non-print materials vary from one of a number of existing "official" methods (See Figure 4, Major Codes for Cataloguing Non-print Materials Used in School Libraries) to, especially in smaller schools, home-made methods which may be as simple as a list of titles.

The variation of treatment of library materials in schools is reflected in the consequent variety of services offered by library jobbers such as the National Book Centre (66 Northline Road, Toronto, Ontario) and Baker and Taylor Co. (an American firm) which distribute, catalogue, and process books or libraries. The act of processing usually means supplying one or more products such as: spine labels, plastic protective jackets, borrower's cards, and other appropriate labels and supplies. Many school libraries purchase exclusively from these jobbers, thereby eliminating original cataloguing and processing from the responsibility of the school librarian. Prices and details of these services are outlined in Figures 5 and 6.

Figure 6 especially illustrates the wide variety of procedures which may be followed by school libraries in their organization of educational resources. This variety is most notable in the area of classification and subject headings where one or more of several combinations is apparent.

For example, Canadian librarians may use one of two versions of the Dewey Decimal Classification system (of which there are 19 and 11 editions) or the Library of Congress classification scheme. With reference to subject headings, they may use Sears or Library of Congress subject headings, each of which is supplemented by an additional Canadian comparison or authority and which is also subject to periodic revision in order to accommodate changes in language and new disciplines in the classification of knowledge. When one considers that subject access in most libraries relies on these classification or subject heading systems, it is not surprising that many users express a desire for better

Figure 4

Major Codes for Cataloguing
Non-print Materials Used in School Libraries

Tillin, Alma W. Standards for Cataloguing Non-print Materials. 4th ed. Washington, D.C.: AECT, 1976

Tillin, Alma W. Standards for Cataloguing Non-print Materials. 3rd ed. Information Science Committee, AECT, 1972

Tillin, Alma W. Standards for Cataloguing Non-print Materials. 2nd ed. Cataloguing Committee, AECT, 1971.

National Education Association. Standards for Cataloguing, Coding and Scheduling Educational Media. Department of Audiovisual Instruction, NEA, 1968.

Welhs, Jean Riddle; Shirley Lewis; and Janet MacDonald. Nonbook Materials: The Organization of Integrated Collections. Ottawa: Canadian Library Association, American Library Association, 1973.

Welhs, et al. Preliminary edition, 1970.

Anglo-American Cataloguing Rules, North American Text. Chicago: American Library Association, 1967.

AACR2. Revised Chapter 6, 1974.

AACR2. Revised Chapter 12, 1975.

AACR2. Revised Chapter 14, 1976 (also found in LC Cataloguing Service Bulletin 115, Fall 1975.)

Cataloguing and Processing Costs of two Library Jobbers:

National Book Centre and
The Baker and Taylor Company

National Book Centre

Only one of these services may be requested for any order

- ☐ (a) Books Plain
- ☐ (b) Books with Cataloguing & Processing
- ☐ (c) Books with Kits Only
- ☐ (d) Processing Only
- ☐ (e) Jackets Only

NOTE — MULTIPLE COPIES

If multiple copies of a title are ordered and you have not ordered a, d, or e, and if you do not wish services b or c for all copies of a title, then please check one of the following:

- ☐ (f) Single Volume of a title Catalogued & Processed - remainder processed only
- ☐ (g) Single Volume of a title Catalogued & Processed - remainder plain
- ☐ (h) Kit for single volume of a title - remainder Plain

Cataloguing Style requested (Complete only if b, c, d, f, g, or h has been ordered)

- ☐ (ADS) Abridged Dewey with Sears (C&P \$1.17 per volume. Kits \$1.03 each)*
- ☐ (DWS) Dewey with Sears (C&P \$1.55 per volume. Kits \$1.41 each)*
- ☐ (DLC) Dewey with Library of Congress (C&P \$2.09 per volume. Kits \$1.95 each)*

POCKETS . . . in the back ☐ or in the front ☐

THE BAKER & TAYLOR COMPANY

PROCESSING

Completely cataloged and processed books	99c
Cataloged and processed books without Mylar jacket	79c
Books with Mylar jacket and kit, both unfastened	89c
Books with Mylar jacket only, fastened or unfastened	40c

KITS OR CARD SETS*

(L) Unfastened kits (includes book pocket, book card, spine label and complete set of catalog cards)	69c
1 one kit per book	
2 one kit per title	
Catalog cards only	50c
3 one set per book	
3 one set per title	

THEFT-DETECTION DEVICES

Installation of commonly used theft-detection devices is offered.

With complete processing	35c
Otherwise	40c

Figure 6

Services of National Book Centre including
BABS (Book Acquisition and Bibliographic Services)

National Book Centre catalogues print material in the English and French languages. The cataloguing service is not available for the following kinds of material: books in languages other than English and French, newspapers, periodicals, music scores, Government documents, technical reports, vertical file material, maps, out-of-print or remainder titles, audio-visual materials, books that are not bought from National Book Centre, and some mass-market paperback titles. We undertake to catalogue all quality paperbacks, providing this service has been requested; however, we reserve the option to reject any mass-market paperback title that, in our opinion, should not be catalogued.

CATALOGUING SERVICES

The following combinations of subject headings and classification are at present available to all customers:

No. 1 Service

(A.D.S.) Abridged Dewey Decimal Classification and Sears Subject Headings.

No. 2 Service

(D.W.S.) Dewey Decimal Classification and Sears Subject Headings.

No. 3 Service

(D.L.C.) Dewey Decimal Classification and Library of Congress Subject Headings.

Classification is by the latest edition of the appropriate schedules that were available at the time the

title was catalogued by National Book Centre. Subject headings will be based on the latest edition of the appropriate subject heading list. For Canadian materials, Sears Subject Headings are supplemented by the Canadian Companion, and Library of Congress Headings are supplemented by the Canadian Subject Headings from the National Library of Canada.

BABS® provides Professional Cataloguing and Processing Services which offer the flexibility and options required by most types of libraries.

The Cataloguing Services are based on the latest editions of classification schedules, subject heading lists, and cataloguing rules. In 1980, National Book Centre began using the 2nd edition of the Anglo-American Cataloguing Rules, the 19th edition of Dewey Decimal Classification, the 11th Abridged Edition of the Dewey Classification, and the latest editions of Sears and Library of Congress Subject Headings, supplemented by the Canadian Companion to Sears and the list of Canadian Subject Headings from the National Library of Canada.

The Cataloguing Services are tailored to the requirements of the customer and allow for optional treatment in such areas as biography, fiction, easy reading, cutting (author letters), designation of juvenile materials, etc.

subject access to library materials.

It should be noted, however, that with reference to cataloguing codes (which are distinct from classification and subject system) librarians have recognized a need for standardization and, insofar as print products are concerned (books), the second edition of the Anglo American Cataloguing Rules is now recognized as the accepted standard.

AACR2 is the first code to apply an international standard to both print and non-print materials. All of the relevant information about non-print materials can be presented in a uniform, predictable format. This has implications for any cataloguing activity which intends to accommodate various media types of educational resources. AACR2 rules for non-print materials were developed from the first edition of AACR2, the revised chapters 6, 12, and 14 of the first edition, and Canadian, American and British rules. AACR2 provides much more specific guidance in dealing with non-print formats than any other current code. Yet it permits flexibility in determining the extent of description based on individual needs.

In addition, AACR2 devotes an entire chapter (the ninth) to the medium entitled "machine-readable data files". This medium, by definition, includes such items as computer data files (social survey data, bibliographic files), textual files, and computer software (educational programs, computer models, commercially-produced software for minicomputers, locally-developed programs).

Because bibliographical control of software is still in the infant stage, it was difficult to find examples of actual application of the ninth chapter of AACR2. However, contact was made with the Curriculum Lab at the Faculty of Education, University of Alberta which has used AACR2 in the cataloguing of approximately 200 examples of educational software. Because the

concept of an integrated collection (a collection which organizes all materials, regardless of media type, in the same way) is deemed an important one at the Lab, the use of the same standard cataloguing rules for software as other media is highly desirable. Librarians find the code easy to apply and see no reason to treat the material any differently from other library materials. Their only complaint echoes similar laments of their users - the inefficiency of present subject and classification schemes when providing subject access. (This problem is further discussed in Section 2.2 - Indexing).

Bibliographic standardization is the key to any type of cooperative resource information sharing venture. If school librarians and other educational learning materials centres hope to become involved in information networking (especially computer-based networking), they cannot continue to use local codes and manuals for cataloguing shared materials. AACR2 presents school media specialists with available cataloguing guidelines adequate to the task at hand - providing a good catalogue entry for all of the materials they collect and use.

If schools and other educational institutions wish to participate in library networks, they will have to conform to AACR2 standards. Relatively few schools currently participate in bibliographic networking supported by automated shared cataloguing such as that associated with UTLAS. However, as schools begin to respond to the pressures to join with other schools and libraries of other types in the interest of information sharing, they will be getting cataloguing records from these utilities (UTLAS). Schools will have to adopt the code (AACR2) if they are to receive the full benefit from network participation.

It is, therefore, proposed that any library cataloguing records created for educational software be based on the AACR2 code.

2.1.2 Vendor Catalogues

The vendor catalogue contains information about products available for purchase and is used by educators as a selection tool. There are numerous catalogues of educational software which are published by the vendor or by cataloguing agencies. Their usefulness is impaired by the following factors:

- a) insufficient information;
- b) questionable value judgements inherent in the subjective nature of each;
- c) inadequate indexing systems (may be indexed by machine, application, "education", or very broad subject headings - "mathematics", "science") which inevitably require the reading of each and every description to determine material appropriate for grade level and subject;
- d) lack of standard format for descriptions - between and within catalogues, making intelligent comparison exceedingly difficult;
- f) profusion of different catalogues (supplied by publishers and producers often providing different descriptions of the same materials).

Examples of these catalogues appear in Appendix IV.

There is a definite need for a catalogue of available educational software which:

- a) lists public domain and commercially produced

- software (although this might best be accomplished by separate catalogues);
- b) provides thorough, standard descriptions;
 - c) can be used by educators to indicate what educational software is currently available;
 - d) can be updated yearly to reflect new materials;
 - e) provides suitable indexing by subject so that users can easily locate appropriate descriptions within the catalogues;
 - f) provides indexing which allows users to locate "known" materials easily;
 - g) provides sufficient information to allow the user to determine whether or not the material is suitable (i.e. hardware specification, cost, availability, instructional methods, topics addressed, etc.);
 - h) can be produced economically and efficiently.

In summary, librarians and educators in the field have indicated a need for two kinds of cataloguing information and access. See Figure 7.

Any proposed methods for improving information dissemination regarding educational software will have to take these needs into account.

Figure 7

CATALOGUING NEEDS

A SELECTION TOOL
FOR PURCHASERS

FUNCTION

INDEXED BY

DELIVERY

- provide a complete description
- indicate characteristics unique to the package and medium
- interface with similar tools for other educational resources
- provide guidance for education attempting to determine appropriate existing materials

- machine
- subject
- topic within subject
- keywords
- instructional strategy
- grade level
- application

- print catalogue
- on-line database (like ERIC)

A LIBRARY TOOL

- provide original cataloguing format
- indicate contents of a collection
- interface with other learning resources in the collection
- let teachers and students know what exists in collections to which they have access

- title
- author
- traditional subject classification (Sears or Library of Congress)

- 3 x 5 cards
- COM
- on-line database (like UTLAS)

Any proposed method for improving information dissemination regarding educational software will have to take these needs into account.

2.2 Indexing

2.2.1 Library Indexing

An indexing system attempts to link the user with those materials in a collection which are appropriate for his particular purpose. Materials in libraries are most often "indexed" by title, author, and a subject heading derived from one of the traditional subject heading schemes (Sears or Library of Congress). When a user is trying to locate a specific record, as long as the exact title or author are known, then the record can easily be found, referenced to a call number and subsequently retrieved from the shelf.

However, searching for materials on a certain subject is often a frustrating assignment. Numerous problems arise for the user as a result of indexing the contents of a growing collection by a traditional list of subject headings:

- a) subject terms become outdated and fail to keep pace with contemporary educational jargon
- b) terms may be too specific
- c) terms may not be specific enough
- d) "see" and "see also" references, which attempt to link the user's entry vocabulary or term to the "correct" term - or the term used by the indexer, need to be constantly updated.

2.2.2 Print Catalogue Indexing

Although the card catalogue at the local library presents problems regarding subject access, the subject indexing offered by most vendors' print catalogues is less than adequate. Educational software is often simply listed under "education" or may be broken down to include "Math and Science" or "Language Arts". Some education specific catalogues may derive as many as 15 - 20 subject headings, but the user is still often required to read all descriptions in the catalogue in order to find materials which cater to subject, grade level, and hardware specifications.

2.2.3 ERIC

Some organizations concerned with indexing large numbers of educational materials such as ERIC and NICEM solve the problem posed by subject access via broad traditional subject headings by establishing their own list of subject headings or descriptors. This new vocabulary of keywords is developed with their specific discipline in mind and, as such, provides an excellent list of specific terms appropriate in the indexing of educational documents.

The controlled vocabulary for ERIC is found in the ERIC Thesaurus, an excellent tool for indexers and ERIC users, which provides an alphabetic listing of all terms. Each entry links descriptors with more specific or broader terms, indicates how many times that descriptor has been used to index a document at the time of publication of the Thesaurus, and most include scope or explanatory notes which give a definition of the descriptor. The Thesaurus also lists old descriptors with their new, more appropriate descriptors and provides several useful searching tools such as a rotated descriptor display.

The ERIC vocabulary represents a successful attempt to establish and maintain a controlled vocabulary of educational terms. However, the ERIC system was developed for machine retrieval. Each document is linked to a number of ERIC descriptors and by using combinations of these descriptors, appropriate documents can be retrieved by computer in a very efficient manner whereas the manual application of these descriptors proves quite awkward. For example, a software package might hypothetically be assigned descriptors designating subject: MATHEMATICS, ADDITION; grade level: ELEMENTARY; and, since we are being hypothetical, hardware: APPLE II. Using these descriptions in combination in an automated information retrieval system might generate a set of document references which could easily be

consulted. However, using only one of the descriptors (as one must when consulting a print index) would, in each case, access a large number of descriptions, all of which would need to be read in order to eliminate the inappropriate references (i.e. MATHEMATICS, ELEMENTARY, PET or MATHEMATICS, ADDITION, SECONDARY, APPLE II).

When and if on-line catalogues become the rule, rather than the outstanding exception (and that day will come), a keyword system which links descriptors together, such as the ERIC system, will be most useful to Canadian educators. However, in the interim, the print catalogue is the most accessible tool available and thus, any contemplated indexing method must accomodate the one dimensional nature of the indexing structure of this instrument.

2.2.4 PRECIS

There is a system, currently in use in Canada, which can approximate the level of specificity of a keyword system, offer an alphabetic subject index which displays simultaneously all keywords or concepts used to index a record, and which has been adapted to accommodate on-line searching. This system is called PRECIS (Preserved Content Indexing System).

PRECIS was developed to produce, by computer, a printed index for manual retrieval, but its design accommodates the potential for machine retrieval. Pre-coordination of terms (or pre-combination of distinct concepts) is achieved by stringing together natural language terms according to strict rules of systems laid down in the PRECIS string.

PRECIS preserves pre-coordination and facilitates manual searching - a necessity for small Canadian education libraries. But, should technology develop so that on-line retrieval is available and economically viable to all users, PRECIS has already been developed to serve in the new situation. (The National Film Board's FORMAT, a bilingual national computerized audiovisual information system, uses PRECIS to provide subject access to its film file. This information is available to users in computer-generated hard copy catalogues, computer-output microform (COM) and on-line. PRECIS has been found to be effective in the context of all three forms of output).

It should be pointed out that PRECIS is more than an indexing language; it is a machine-produced alphabetical indexing system, based on syntax derived

from a study of natural language. Therefore, it includes the manipulation programs as well as the instructions for indexing. Considered as a language, PRECIS differs from other indexing languages insofar as it consists essentially of a set of working procedures, not a prescribed list of term or phrases. This means that an appropriate list of terms, linked to traditional subject lists but infinitely more flexible, could be generated.

One of the potential products of PRECIS is a thesaurus. Because PRECIS is a flexible natural language system, the thesaurus can be developed to reflect Canadian usage.

The Library of Congress, Sears, and Dewey Decimal systems were developed for manual production and manual search methods. Pre-coordination of terms aids enormously in manual retrieval. However, broadness of the terms produces many irrelevant citations during machine retrieval.

The ERIC system was developed for machine retrieval. Unbound terms used post-coordinately make it ideal for machine retrieval but most awkward for manual use.

PRECIS seems most appropriate for present needs of users of educational software in that it:

- a) caters to both manual and machine retrieval systems;
- b) can be used to reflect Canadian terminology;
- c) has already been utilized in a bilingual application;
- d) the PRECIS software is readily available in a Canadian system (UTLAS);
- e) has proven useful in the indexing of non-print materials generally and educational software specifically.

Appendix IX is devoted exclusively to PRECIS and provides information about four current users of the system (3 Canadian, 1 American; 3 non-print materials, 1 print) and more specific information about how PRECIS works.

2.3 Delivery Systems

Consideration of a vehicle for delivery of the information services required by users of educational software was necessary during this research, notwithstanding the contract stipulation that consideration of a delivery system was outside the scope of the project.

2.3.1 Centralized vs. Decentralized Systems

Before proceeding to an outline of delivery system options available, it may be useful to summarize the advantages and disadvantage of a centralized versus decentralized system.

A centralized system offers the following advantages:

- a) avoids duplication of cost and effort;
- b) it is cheaper for provinces to share in creation of one system than for each province to sponsor this work on its own;
- c) central cataloguing records mean that material need only be catalogued once and then made available for sharing;
- d) in spite of some provincial uniqueness, most educational software is relevant to all provinces and therefore, information about that software is of interest to all participants in the system;
- e) allows 12 regions to benefit simultaneously from the expertise and services of a coordinated effort which includes the delivery system and a clearinghouse;
- f) updating one database is easier and cheaper than updating numerous databases;
- g) producers are more likely to cooperate with a coordinated, authoritative venture than with numerous, small, disjointed ones;
- h) the problem of obtaining evaluations may be more easily solved through cooperation and sharing of results than proceeding independently;
- i) some provinces which might not otherwise have the resources to establish their own system would especially benefit from a cooperative effort.

A decentralized system offers these advantages:

- a) the system can cater to specific provincial needs;
- b) the province maintains complete control of information and procedures;
- c) there is no need to alter provincial formats and procedure to accommodate those of other provinces;
- d) a delivery system could be selected that is compatible with an existing provincial hardware network;
- e) experts in the use and structure of the system would be available locally rather than nationally.

A compromise which invites the advantages of both systems is a distributed network which coordinates input from and products for provinces in such a way that cost and effort is shared while unique provincial requirements are also met.

However, a distributed network has some problems of its own which must be addressed before it represents a viable alternative. These issues include:

- a) At present, because of the provincial educational structure in Canada, there is no authority or organization with the mandate and resources to coordinate such an effort.
- b) Subscription to a cooperative network brings extra responsibilities to participants in terms of data submission (a standardized format must be adhered to).
- c) Well-defined policies/procedures will need to be established to protect the integrity of the central database.
- d) The more extensive and sophisticated the design of the distributed system, the greater the requirements for a central system to control the network.
- e) Some provinces are better able to contribute resources to such a network than others.

2.3.2 MARC Format

The first implication for the use of any delivery system which aspires to exchange cataloguing data via computer will be the use of MARC format in record storage. The original MARC format document established conventions for encoding data for monographs in a machine-readable form. Though it was understood that early applications were going to relate to the production of catalogue cards, the MARC format looked ahead to an increasing emphasis on data retrieval applications.

The MARC system works in the following manner: records are created in standard form, and each element of the record (eg. title of items) is given a code or tag specific to that class of elements. The records are punched on to a computer input tape as a string of tagged elements, through a conventional keyboard machine which immediately types them back for checking. After checking, the records are stored on the computer input tape until required.

The original purpose of the MARC format is still a cogent and necessary one - that of allowing for a great variety of individual library needs for products, practices, and policies via a standardizing communications format. Both catalogue card production and on-line retrieval necessitate the same level of specificity, though particular tags, indicators, and subfield codes may vary.

Benefits that accrue to computing operations as a result of the MARC format include the use of a communications format which facilitates communications, card/COM production, and on-line information retrieval.

As a communications format, it is as coherent as any other structure for carrying bibliographic data. Because the format allows for a very specific level of detail in description, computing operations can supply a variety of products to fill a variety of needs.

In cataloguing activity, the benefits from the use of the MARC format as part of an on-line cataloguing system permit the machine-production of catalogue cards at a major savings over manual production. Second, access to a shared cataloguing database permits the use of "clerical" cataloguers at a considerable cost saving per item when compared to "original" cataloguing. Third, depending upon the information available in the cataloguing record, the time required for decision making during the cataloguing process can be decreased significantly.

The benefits of the use of the MARC format continue to be in the ease with which bibliographic information can be shared and the concomitant beneficial impact on cost control. In addition, the MARC format supports a host of other standards and codes and the benefit from these relationships has been consistency in and fostering of standards development.

The MARC format for machine-readable data files (MRDF) is one of a series of communications formats developed by the Library of Congress. Since the Library of Congress does not have any plans to catalogue MRDF in the near future, this document is being issued as a preliminary edition to allow the library and information communities to test the format. It is hoped that as more experience is gained in the input of bibliographic records for MRDF, additional guidelines or instructions can be added to facilitate understanding and application of this format.

The format structure has been designed to accommodate machine-readable records describing all kinds of materials and designed for a variety of uses.

The Library, for example, has developed formats for books, serials, maps, films, manuscripts, music, sound recordings, and authority information. Formats for technical reports and analytics are being defined. This format for bibliographic records describing machine-readable data files has benefitted from this earlier work as well as from the ongoing analysis of the problem areas in the MARC formats.

The MRDF format has been designed to accommodate the data elements specified in the second edition of the Anglo-American Cataloguing Rules (AACR2), but the data elements included in the format have not been limited to those described in AACR2. Also, the explicit identification (or content designation) of these elements has been designed to accommodate a variety of products, eg., a data inventory, a data abstract, or a union catalogue, in addition to a catalogue record or use in a library catalogue.

It should be noted that the requirements for exchange of cataloguing data are not always compatible with the requirements for information retrieval. The approach taken in the development of the MRDF format was to include as many of the elements needed to describe the characteristics of the different types of machine-readable files and to exclude elements related to an individual agency's handling of the file. Elements like contact personnel and addresses or details of computer operations to run the file were not included at this time for that reason (It should be noted that flexibility of the MARC format accommodates this information in the form of technical or local notes). It is hoped that with experience in using the MRDF format to describe different kinds of files, decisions can be made in the future concerning such elements.

2.3.3 Computers and Library Procedures

The last five years have seen traditional cataloguing revolutionized by the use of the computer as a delivery system. Change has taken place mainly through library networks of one sort or another. Examples of these networks include UTLAS in Canada and OCLC in the United States (refer to Glossary for discussion of each).

There are basically three forms of output from these networks. The form most popular with school libraries is still the 5" x 3" catalogue card. This use of the computer to produce something old (albeit in a new way) represents acknowledgement of the fundamental conservative nature of libraries. The second type of output is Computer Output Microfilm. This form of catalogue has taken the place of the computer produced book form catalogue (bound computer) print out which was popular for a while. It seems probable, because COM is so much cheaper to produce than any other form of output, that its use will speed up over the next few years, and more and more libraries will be going over from cards to COM. For a thorough discussion of the benefits of COM and the inadequacies of the card catalogue refer to items 2.2 and 3.0 of A Computerized Learning Support System for Ontario in Appendix IV.

There is little doubt that the third form of output will ultimately replace the former two. This is a catalogue which is consulted on-line through a terminal. At the moment, economic restraints will necessarily delay the use of this method.

Two additional capabilities provided by the application of computers to cataloguing bear mentioning.

The first of these is an authority file managed by the computer system. This means that any heading which is input will be checked against this authority file and will not be allowed to join the database unless it conforms to standards that have been agreed upon by the network. The second development will be a facility for the computer to automatically change headings throughout the database. These elements will allow new concepts in cataloguing to be universally implemented and for errors and inconsistencies to be corrected at a modest cost.

2.3.4 Options

There are essentially two directions one might follow in selecting a delivery system suitable for the task of creating a database of educational software and providing certain products, notably library records and a print catalogue.

- a) Purchase a database management system and have it customized to provide the service required. Information about various systems appropriate for this purpose appears in Appendix VII. In the opinion of the research team, this approach is likely to be the more expensive of the two options.
- b) Approach vendors of commercial database management services (on-line databases) and determine the extent to which information requirements of the users must be compromised in order to accommodate file structure of the vendor. In the opinion of the research team, there exists a ready, working Canadian system in the combined use of UTLAS and FORMAT (National Film Board).

Both of these options assume the establishment of an on-line database. During our field studies, it became obvious that the understanding demonstrated by educators of the concept of a database varied. In order that this concept might be more completely understood, the following background information is useful.

2.3.5 On-line Databases

DEFINITION: On-line databases - computer-readable collections of data - are available for interactive access by users from remote computer terminals. These databases contain numeric, textual, or combinations of data areas, that can be used to meet both general and specific information needs.

BACKGROUND: A user sits at a computer terminal in the library, office, laboratory, or home, and dials a local telephone number (modem) with a computer in some other location. Using a special password, the user gains access to this "host" computer and requests access to the particular system and database of interest. The interaction language of that system, which is designed for use by persons without any computer programming background, permits them to retrieve and display specified information and, in some cases, to do statistical manipulation and other types of processing.

Since the mid-1960's, several streams of technologies and capabilities have come together to support the development and use of on-line database services. These technologies include the following:

- 1) Collections of numeric data and/or textual information (databases) that are processed by publishers and other organizations in computer-readable form for electronic publishing of printed materials.
- 2) Powerful timesharing computers that permit a very large number of users to carry on simultaneous interactions with systems through terminals that may be located far from the central computer and its store of data.
- 3) Interactive computer programs (software) that are

- increasingly efficient, powerful, and user-oriented.
- 4) Rapid-access storage devices that have contributed to increase in capacity and reliability and, at the same time, decline in per-character data storage costs.
 - 5) Computer terminals that can transmit and receive at various speeds - including 30 characters per second (300 baud) and 120 characters per second (1,200 baud) - and are more compact, portable, and less expensive than ever before.
 - 6) Telecommunication networks that provide local access numbers in cities throughout the world for dialing into a remote computer at far less than the cost of dialing long distance.

During the period in which on-line database services have been developing, there has been an increased recognition of the role that information can play in meeting the needs of professionals in corporations, educational institutions, public agencies, and other types of research and service organizations. Although on-line databases have only rarely been subjected to cost-benefit analyses that demonstrate specific savings of time and dollars, user reports leave no doubt that they represent a valuable resource. The use of such databases can help to eliminate duplicative unnecessary research and development, introduce and promote the transfer of new ideas, services, and technologies, identify baseline data to help support the development of long range plans, simulate and forecast laboratory and economic situations, and identify or provide background and support data in a broad range of problem-solving situations.

PRODUCERS: Databases are developed by a group of suppliers referred to as "producers". In some cases, particularly for reference databases, producers are primarily publishers of printed index and abstract journals. These organizations - both the public and private sectors - acquire, screen, select, index, and sometimes abstract or summarize the primary literature. To produce their printed publications, these

organizations have adopted automated systems for phototypesetting and thereby generate a magnetic tape that can be used further for computerized processing, particularly in storage and retrieval systems.

ON-LINE SERVICES: There are several kinds of organizations that provide on-line access to databases. The largest group of these organizations are timesharing firms, which provide access primarily to numeric databases. These timesharing firms are also known as "network information services" and as "remote computing services." They provide a number of services, including the use of their computers for the general data processing needs of an organization, consulting and development work in systems, and program development. The provision of database services has been an outgrowth of this tradition. The other on-line services are generally embedded in organizations that have a commitment to various other information or data processing activities, although a few are organizations completely devoted to the provision of on-line database services.

ACCESS: Pricing policies for access to and use of the on-line database services are extremely complex. There are a number of components to the prices and they are combined in many different ways. In addition, prices are subject to change with fairly short notice. All of these factors make it extremely difficult to treat the topic in a standard manner. However, there are some general points that can be made about pricing.

In at least 30 percent of cases, there is an indication that some type of subscription is required for gaining access to the database. These subscriptions range from a few hundred dollars per year to several thousand dollars. In some cases, the user had several options, each a combination of a subscription price and associate usage charges.

Input Charges

Connect Time: An hourly rate, ranging from \$1.00 to \$21.00, that is charged for the period during which the user is connected to the system. (This figure may or may not include telecommunications charges).

Computer Resource Units: A rate for actual use of the system that combines charges for use of the central processing unit (CPU), the amount of input/output (I/O) required to read and write disks and interact with the user's terminal and, sometimes, charges for the user's workspace in the computer memory. The charges for these units (sometimes called CPUs) range from \$.01 to \$1.25 per unit. However, they cannot be compared across the on-line services because the formulas that are used to calculate charges vary from service to service.

Disk Storage: Additional costs are incurred if a user elects to store a selected amount of data from a database, perhaps along with the user's own data, in a "private" file.

Searching Charges

In most other cases, costs for database services are based on an hourly connect-time rate, plus telecommunications costs for network access, if applicable. The hourly connect-time rates that are cited in the supplier's literature may include a royalty, or a royalty may be cited separately. The range of connect-time rates (including applicable royalties) is from about \$25 to \$300 per hour. The average is approximately \$65 per hour.

For bibliographic and some referral databases, there is an additional charge for off-line printing,

which is generally based on the number of citations or pages. The range of charges for off-line printing is from \$.05 to \$5.00 per citation, although for a few databases they may be considerably higher. The average is about \$.15. There may also be charges for on-line printing (ie. displaying retrieved information directly at the terminal). These fees range from \$.50 to \$50.00 per item. Both on-line and off-line printing charges may vary depending on the amount of information that is printed.

When one considers the complexities involved in database creation and maintenance as outlined above, it becomes clear that school systems do not have the resources or expertise to manage this kind of operation. Therefore, it is recommended that original construction of a database and delivery system be avoided if an existing delivery system with the expertise required can be found.

2.3.6 History of a Non-print Database

Now that the concept of an on-line database has been outlined, it may be useful to summarize the origin and development of such a database dedicated to the description of non-print materials. This summary should indicate the planning and coordination required for a task of such scope.

It is important to note that the database described (NICEM) is not suggested as a potential vehicle for information about educational software (the stipulation that any such database must be resident in Canada effectively eliminates NICEM). Rather, it represents a precedent which cannot be ignored. This summary draws extensively from an article by Slusser which appears in September 1980 Database entitled "Nicem, the Non-print Database".

NICEM (National Information Centre for Educational Media) began at University of Southern California in 1959 when a computer was used to produce a film catalogue for the Cinema Department File Distribution Section.

This initial effort generated so much interest among members of the Audiovisual Association of Southern California that they encouraged and assisted U.S.C. personnel in the development of a pilot project for the purpose of studying the feasibility of large scale automated cataloguing and a grant was sought from U.S.O.E. (United States Office of Education).

The potential value of the database as a source of information was acknowledged when the project formally

became an official purpose of the new organization in addition to automated cataloguing work.

When the first indexes were published, they covered only the 12,000 items in films and filmstrips. To expand future indexes beyond this level, NICEM invited producers/distributors to submit information on new releases, plus revise or update information about existing software where appropriate. In addition, NICEM made an agreement with the Library of Congress (1966) that information on new media releases sent to L.C. could be used jointly. L.C. would use the information to produce catalogue cards and NICEM would use it to make new entries in the database.

Media software is a complex and elusive bibliographical area. Attempts to develop control mechanisms have met with only partial success due to high development costs, difficulties in securing consistent flows of up-to-date information and problems in the media profession. The indexes produced by NICEM are now among the most authoritative sources of bibliographical information currently existing and with the assistance of media producers/distributors plus the cooperation of the Library of Congress, they are being expanded and improved.

Until Lockheed Information Systems arranged to include NICEM in its commercial online Dialog service, the only access to its data was through subscription to the index service or patronage of a library subscribing to the indexes. Anyone needing information about media software either had to make a search through eight separate indexes to locate desirable items or use alternative sources of information which were less comprehensive in scope. Now, with the inclusion of NICEM in Dialog services, its .5 million items are accessible.

The NICEM database presently includes: Films, Filmstrips, 8mm Film Cartridges, Transparencies, Audio

Tapes, Video Tapes, Records and Slides. Their current guides for formatting entries are: The Anglo-American Cataloguing Code and AETC's (Association for Education Communications and Technology) Standards for Cataloguing Non-Print Media.

2.3.7 FORMAT/UTLAS

Canada has the makings of a database similar to the NICEM concept. This potential exists in a delivery system which comprises a joint effort of UTLAS and a program called FORMAT (Canadian Audio-Visual Products Information System) which has been developed by the National Film Board. This delivery system has the potential to offer the following to Canadian users of educational software:

- a) A Canadian system.
- b) A system which caters to non-print media.
- c) Cataloguing experience and service.
- d) Print catalogue production.
- e) On-line cataloguing records.
- f) Production of library products.
- g) Expertise in the use of AACR2 and MARC format.
- h) On-line information retrieval which is user-friendly.
- i) Consultation and support services.
- j) A cross-Canada hardware network (through UTLAS and NFB offices).
- k) Access to PRECIS software.
- l) Interface with information regarding educational resources in various media forms.

Further information about FORMAT/UTLAS is available in Appendix IX. It is the opinion of the research team that no other delivery systems exist which offer all of the above combinations of services and that negotiations should therefore begin to determine the cost and implications of using such a system.

3.0 STANDARD DESCRIPTION

3.1 Introduction

The first step in any attempt at sharing information to be gathered from numerous sources is to establish a standard for all descriptions. Various benefits may be derived from this uniform structure for information provision:

- a) Users of the descriptions who become familiar with the structure will know what kind of information to expect and where to best locate it within the whole record structure.
- b) A standard physical and intellectual structure lends itself more easily to the task of comparing different records.
- c) It is much easier to integrate records from various sources if they follow the same structure. This integration or coordination of information from different sources is paramount in the operation of a shared database.
- d) A standard format is more likely to encourage submission of information from publishers and authors than a general "call for information".
- e) Once producers of educational software are familiar with a widely used common format, they may tailor their product literature and development to standards implied by the format.
- f) Consideration of a delivery system cannot take place until an indication of record structure and size is available. A standard description makes possible an assessment of this structure and size.

Once the guidelines for a standard description are set a number of other steps can be taken in the process

of information gathering. Input forms which allow for submission of information about educational software can be designed. These forms, accompanied by guidelines or instructions, can be circulated to individuals or groups who have information to share. When these forms are collected and processed, a database of information can begin to emerge.

It is important to note that these initial forms serve the purpose of gathering raw data. This data can then be manipulated, processed and restructured to suit the needs and requirements of users and the selected delivery system. Not all the information gathered may appear in all products generated by the database. However, it is important that the initial gathering of data be as comprehensive, organized and thorough as possible. Deletion or omission of data is a much simpler matter than additional solicitation of data subsequently found to be important.

The suggested description has been broken down into data elements which are arranged in successive "fields" of information. A "field" is a record division usually reserved for individual data elements such as "author", "producer", or "title". The following considerations regarding field selection were kept in mind during the process of field definition:

- a) More, rather than fewer fields, will increase the on-line searchability of records.
- b) Separately defined fields have no bearing on the appearance of the printed or displayed record.
- c) Record fields and display format should not be confused. The former represent data elements entered into a system for each and every record and which may or may not be used as access points to the latter (display format) which can be made available in a variety of forms depending on the user and the vehicle of display. For instance, a very abbreviated format may be more appropriate for cards and COM than a full format (all data elements recorded).

- d) A field should be assigned to each unique data element that will appear at some time in the database, regardless of the frequency of that appearance. All data elements will not necessarily appear in all records. Allowance should be made for even the most infrequent of data elements which will enhance searching for certain records.

In addition, fields were selected which were deemed appropriate to the following users:

- a) educators who require a comprehensive description in order to compare and select software;
- b) librarians who require cataloguing records in order to process software which becomes part of the library collection;
- c) students who wish to determine software appropriate to their needs;
- d) information specialists who wish to organize and disseminate information about educational software in the most useful and efficient manner possible;
- e) Ministry of Education personnel requiring information on which to base curriculum and policy decisions;
- f) producers who may find descriptions useful for comparison and development needs.

3.2 Problems

Section 3.3 (Suggested Fields) of this report presents 26 recommended fields of information deemed useful in a standard description of an educational software package. A concentrated effort has been made to anticipate all data elements likely to be useful to educators.

During the process of defining the components of a standard description, JEM was able to draw from:

- a) suggestions from educators in the field;
- b) numerous existing descriptive formats for educational resources generally and software specifically; and
- c) JEM's own familiarity and experience with the medium.

It is important to note that discussion and consideration of potential fields could not take place without a simultaneous consideration of certain practical problems posed by the eventual implementation of such a description. That is to say, the instrument (the standard description) could not be developed without considering the process by which it might be applied - even though this process might conceptually belong to the realm of the delivery system (not considered a term of reference or deliverable for the report).

Consequently, certain assumptions and decisions had to be made during the course of field definition in order that the instrument of a standard description might be developed. These assumptions/decisions will appear as recommendations in section 4.0 of the report (Implementation Plan).

However, it is appropriate that a thorough discussion of the rationale for some of these recommendations appear at this point in the report, in order to avoid questions which would otherwise certainly surface during a reading of the section on Suggested Fields.

The following three recommendations or assumptions were made by JEM during the field definition process:

- 1) A database (manual or automated) of information concerning educational software needs to be developed.
- 2) Although this database will contain various categories of information including evaluative information, the highest priority should be that of a Descriptive File of software. The fields in this File should be of a purely descriptive nature and should not contain evaluative comments. Once the procedures for establishing a Descriptive File exist, work can begin on a parallel Evaluative File.
- 3) Completion of fields for each record in this database should be, wherever possible, a cooperative effort which draws from the expertise of different specialists and which is coordinated by a central authority.

A detailed discussion of 2) and 3) above follows in Section 3.2.1 (Evaluation) and 3.2.2 (Field Responsibility).

Finally, the reader must bear in mind (as did JEM staff during the field definition process) that the standard description and the fields of which it is comprised may be affected or subsequently altered by two influences, the impact of which can not currently be estimated. These are:

- 5
- a) regional or provincial differences; and
 - b) the delivery system

These are discussed in greater detail in Section 3.2.3 (Regional Differences) and 3.2.4 (Delivery System).

3.2.1 Evaluation

Fields of a Descriptive File should be of a purely descriptive nature and should not contain evaluative comments.

The initial question regarding what information should be included in a database of computerized education resources focussed on whether or not the database should include only materials that have been evaluated or whether it should include a description of all available materials, good or bad, evaluated or awaiting evaluation.

There are a number of problems if only materials which have been evaluated are listed:

- a) There is at this time no standard evaluation instrument or guideline in use across Canada, although some provinces are moving to adopt a standard.
- b) Each province has its own procedure for evaluating materials to be approved for the curricula.
- c) Each province has its own curricula.
- d) At the present time, there are not enough trained evaluators in the field to evaluate enough programs to warrant a database.
- e) Evaluations that are available have followed no standard evaluation procedure.
- f) Discussions among the provinces regarding a solution to the above problems are just beginning.

On the other hand, there are a number of factors which suggest advantages to educators in the establishment of a descriptive database of available materials:

- a) Teachers independently are collecting and listing

- educational software, although according to no prescribed standards.
- b) There is duplication of effort with no possibility of sharing information or responsibility without an established standard descriptive format.
 - c) Teachers are making the decisions regarding which software will be purchased and they want to know what materials are available.
 - d) New software is appearing daily and educators are not prepared to wait for the results of the evaluations.
 - e) The first step in choosing materials to be evaluated is the organization of information regarding what is available.

It is therefore recommended that a database of computerized materials initially include only fields which simply describe what is available. It is further recommended that any decisions regarding evaluative comments be deferred until agreement exists amongst the provinces as to which evaluation instrument is to be used and who will be responsible for evaluating what materials. This agreement must be reached through national or regional committees given the mandate to discuss these questions. A suggested phased evaluative process is presented in Section 3.3 of the report in the discussion of the EVALUATION STAGE field.

3.2.2 Field Responsibility

Completion of fields for each record should be, wherever possible, a cooperative effort which draws from the expertise of different specialists and which is coordinated by a central authority.

Thus, commercial producers of educational software might supply the majority of information for commercially available materials; representative provincial or regional groups might assume the responsibility of collecting information regarding public domain materials generated in their regions; and a central clearinghouse would monitor supplied fields of information and complete remaining fields. Fields to be completed by the clearinghouse would contain controlled vocabulary terms, which represent substantial risk for variable completion if done by various individuals, or require expertise not available at the provincial or regional level without special training. (See Figure 8 for a more graphic breakdown of these field responsibilities.)

Further discussion of a structure for field format completion and shared responsibility may be found in Section 4.0 of the report.

Figure 8

FIELD RESPONSIBILITY

<u>Fields</u>	<u>Commercial Software</u>	<u>Public Domain</u>
ACCESSION NUMBER	C	C
PACKAGE TITLE	P * C	U * C
SERIES TITLE	P * C	U * C
EDITION	P	U
ISPN	C	U
AUTHOR	P	U
PRODUCER	P	U
DISTRIBUTOR	P	U
COPYRIGHT DATE	P	U
RESTRICTIONS	P	U
COST	P	-
COMPUTER MODEL	P	U
MEMORY	P	U
OPERATING SYSTEM	P	U
LANGUAGE	P	U
STORAGE MEDIUM	P	U
PERIPHERALS	P	U
DESCRIPTORS	C	C
CLASSIFICATION	C	C
APPLICATION	P * C	U
INSTRUCTIONAL STRATEGY	P * C	U
GRADE LEVEL	P * C	U * C
SPECIAL USER	P * C	U
ABSTRACT	C	C
EVALUATION STAGE	C	C
DISPLAY LANGUAGE	P	U

P = information supplied by producer

C = information supplied by clearinghouse

U = information supplied by provincial or regional organization
(computer user groups, etc.)

P * C = information supplied by producer with very careful monitoring
by clearinghouse

U * C = information supplied by provincial or regional organization
with very careful monitoring by clearinghouse

3.2.3 Regional Differences

Some fields will be affected by regional or provincial differences.

The following are examples of fields containing information which may differ in various provinces or regions of corresponding differences in educational philosophy, procedure, history or terminology:

- a) GRADE LEVEL;
- b) COMPUTER MODEL and other fields reflecting system requirements;
- c) DISTRIBUTOR;
- d) SPECIAL USER;
- e) DESCRIPTORS;
- f) EVALUATION STAGE.

For example, in the discussion of the field, GRADE LEVEL, grades 7-9 are designated junior. Ontario would require this category to read intermediate.

In a record describing software which runs on several systems a province which is committed to one system may wish the COMPUTER MODEL field and other systems requirement fields to reflect their preferred system. A province should make this kind of exclusive decision regarding fields in the database very carefully, since hardware systems and habits may change.

Two provinces might each have negotiated distribution rights for a particular package. It would be helpful if the record reflected the provincial agency and contact information unique to each province in the DISTRIBUTOR field.

The SPECIAL USER and DESCRIPTORS fields are

examples where terminology may differ radically between provinces.

In addition to the problem of fields which are important to all provinces or regions but which reflect unique differences, a related issue concerns potential optional fields. These fields represent information which may be required by, or is appropriate or unique to one province or region, but not another. Thus, some provinces may require the presence of fields indicating READING LEVEL or PROVINCIAL INSTRUCTIONAL OBJECTIVES while others may not deem this information possible or appropriate.

A number of potential solutions may solve the problems posed by these inconsistencies. Questionable fields may be flagged to indicate that users should consult a provincial guide which attempts to translate terms or provide sources for unique information. This approach seems cumbersome and difficult to coordinate.

In a cooperative but decentralized system, it may be possible to generate records centrally, according to standard specifications, distribute these records in machine-readable form (magnetic tape) to participating provinces and regions, where subsequent changes or enhancements might be made which cater to exact information requirements of that province or region. This method would ensure the consistency and integrity of the central database while allowing for variation within a derived regional database.

Alternatively, if the changes required to customize the initial record to the needs of a province or region are straightforward and predictable, perhaps automatic subfiles for each province or region could be generated centrally and changes made at the central clearinghouse. Or the changes could be made at the provincial or regional level, forwarded to the clearinghouse, and then entered into a subfile - allowing the province or region to control information contained in these variable

fields.

It may well be that consultation with experts on the delivery system will determine that this flexibility is too costly, not efficient or not possible. In any case, these problems should be addressed by representatives of contributors and users of the database and the systems analysts for the delivery system.

In the discussion of each field definition, (Section 3.3) the field names of those fields which might reflect provincial or regional differences have been asterisked.

3.2.4 Delivery System

The selected delivery system and products of this delivery system may influence field names, display format, definition of individual fields and procedures for gathering information for each field.

Although consideration of a delivery system was not deemed a term of reference for this project, the implications of the above statement clearly indicate that consideration was indeed necessary. It should, therefore, be understood that fields suggested in 3.3 represent information requirements of projectd users and may not take into account the intricacies and protocols of various delivery systems. However, the standard description, as defined by the 26 suggested fields, represents a crucial prerequisite in the consideration of an appropriate delivery system.

3.3 Suggested Fields

FIELD NAME: ACCESSION NUMBER

DISCUSSION: Each record available in the database should be accorded an accession number. This number would be important in any subsequent reference to the on-line database. It may or may not be used in any of the print products. The number would be applied at the clearinghouse in order to eliminate duplicate designation.

Such a number would be particularly useful in the event that a subfile of information is established about each record. For example, if a separate file of evaluations (or Evaluative File) is developed to which the user might be referred by the Descriptive File, then the evaluative information about the descriptive record (available in the Evaluative File) could be sought most efficiently by reference to the ACCESSION NUMBER field, rather than by PACKAGE TITLE, etc. Thus, on finding in the Descriptive File that an evaluation exists for Three Mile Island in the Evaluative File, a user would record the ACCESSION NUMBER from the (Descriptive File), transfer to the Evaluative File, and request the record by ACCESSION NUMBER rather than title.

The ACCESSION NUMBER could be used to designate characteristics of the record (i.e. availability - public domain or

commerical, display language - English or French) which might otherwise require a special field of information. Consultation with the delivery system will determine the usefulness of such a policy.

EXAMPLE:

ACCESSION NUMBER: PD 1234

FIELD NAME: PACKAGE TITLE

DISCUSSION: The PACKAGE TITLE field identifies the educational software and provides an access point for educators who have read about or who have heard about a particular program or series of programs and would like to obtain further information about it.

The term "package title" rather than "program title" is recommended in order to underline the importance of the support materials which can accompany a program. These materials can include extensive documentation, audio cassettes, filmstrips, and specialized peripheral devices.

Furthermore, whereas PROGRAM TITLE is reasonably descriptive when referring to stand-alone programs, it is misleading when referring to educational software that contains an integrated series of programs. For example, Milliken Math Sequences contains twelve diskettes of twelve related but distinct programs supported by one teacher's guide. To use "program title" to describe this product would perhaps confuse educators who might not know whether the "program" referred to software or to an integrated series of educational materials such as the Ginn 720 program.

Completion of this field as defined above creates problems when it is necessary to

catalogue a software program included in a collection of loosely related programs which merit their own descriptive and bibliographical record but are stored on one diskette. An example of this type of product is MECC's Elementary Mathematics Volume 1 which contains a number of stand-alone programs useful in elementary mathematics. The documentation for each program is included in a single manual and all programs are collected on one diskette. Individual programs cannot be purchased separately.

If the PACKAGE TITLE is listed as MECC's Elementary Mathematics Volume 1, a teacher looking for information about "Hurkle" and not knowing that it is on the Elementary Mathematics Volume 1 diskette would not be able to find it. In addition according to the definition of "series" outlined in the SERIES TITLE field, the descriptive fields of the record would refer not to the entire diskette, but to individual programs on the diskette. (Thus by definition, "Hurkle" merits its own record; Elementary Mathematics Volume 1 does not).

It is therefore recommended that in cases in which a program is one of a number of unrelated programs collected on one diskette that the PACKAGE TITLE field contain the name of the program followed by the title of the package. For example, "Hurkle" would be listed as Hurkle, Elementary Mathematics Volume 1.

It is suggested that the program title precede the package title to enable teachers to search for programs

alphabetically in a print catalogue. If "Hurkle" were included after the package title, teachers would have to know which MECC package contained the program before they could locate it.

The use of "PACKAGE TITLE" to describe products which contain a single program on a single diskette - for example, Three Mile Island - should present no problems.

EXAMPLE:

1. For a package containing only one program:

PACKAGE TITLE: Three Mile Island

2. For a package containing integrated programs on a number of diskettes:

PACKAGE TITLE: Milliken Math Sequences

3. For a package containing a collection of unrelated programs on one diskette:

PACKAGE TITLE: Hurkle, Elementary Mathematics Volume 1

FIELD NAME: **SERIES TITLE**

DISCUSSION: The concept of a "series" is not uniformly applied by producers of educational software. "Series" or "sequence" or "program" is used loosely to indicate the collective title of successive components (packages or programs) generated by the same producer and related by subject, purpose, form or grade level.

The inclusion of series information, when this designation is made by a producer, is useful for identification purposes (a teacher may be aware of a series name but not the titles of individual components) and as a means of indicating that a particular record is part of a larger sequence of such programs, packages, or components.

However, the rather undisciplined use of the "series" concept by producers poses problems in distinguishing between a PACKAGE TITLE and a SERIES TITLE and particularly in the decision regarding whether each component of a series merits its own record or description or whether one description for the entire series is sufficient.

Figure 9 illustrates the various organizational schemes of components which might loosely be termed "series".

Figure 9

EXAMPLES OF COLLECTIONS OF PROGRAMS

Producer	Collective Title	L	F	T	E	DS	DT
1) American Peripherals	High School Physics Program	✓	✓	X	✓	✓	✓
2) Milliken	Comprehension Power Program	X	✓	✓	✓	✓	✓
3) Milliken	Language Arts	X	X	X	X	✓	✓
4) MECC	Elementary - Volume 1	X	X	X	X	X	✓
5) MECC	Applesoft BASIC	X	X	✓	X	✓	X
6) Borg Warner	Critical Reading	X	✓	X	✓	✓	✓

L = same educational level for each component

F = same format or technique for each component

T = same topic for each component

E = same evaluation or description appropriate for each component

DS = each component available separately

DT = components available together (one package)

✓ = Yes

X = No

The collective titles listed above represent a collection of components which are unique because of grade level, format, or topic and which are distributed in a variety of ways.

It does not follow that each component of the collection should be listed as a PACKAGE TITLE with the collective title listed in the SERIES TITLE field. This automatically requires the existence of separate records for each component of the collection. This is not always appropriate, as numerous cases exist where a single description of the collection serves to also sufficiently describe each component. Therefore, when choosing PACKAGE TITLE and SERIES TITLE it is recommended that the following rules be applied:

- a) When individual components of a collection are distinct enough in format or technique (i.e. different instructional strategies are used because of differences in grade level or topic) that each component merits its own description and/or evaluation, then the title of each component will appear in the PACKAGE TITLE field and the collective title of all components will appear in the SERIES TITLE field with an indication of the extent of the collection where possible. (See examples 3 and 5 below.)
- b) When individual components are not sufficiently distinct in format or technique (in spite of differences in grade level or topic) and when one description of the collection is sufficient to describe all of its components, then the collective title will appear in both the PACKAGE TITLE and SERIES TITLE fields. In addition, the SERIES TITLE field should indicate the extent of the collection where

possible. (See examples 1, 2, and 6 below)

- c) If individual components of a collection are not separately available for distribution then they cannot constitute a series. (See example 4 below)

EXAMPLE:

1. PACKAGE TITLE: High School Physics Programs
SERIES TITLE: High School Physics Programs (64 programs)
2. PACKAGE TITLE: Comprehension Power Program
SERIES TITLE: Comprehension Power Program (Levels D-L)
3. PACKAGE TITLE: Pronouns
SERIES TITLE: Language Arts - Grammar
4. PACKAGE TITLE: Hurkle, MECC Elementary Volume I
SERIES TITLE:
5. PACKAGE TITLE: Beginning Applesoft BASIC
SERIES TITLE: Applesoft BASIC
6. PACKAGE TITLE: Critical Reading
SERIES TITLE: Critical Reading (Levels A-H)

FIELD NAME: EDITION*

DISCUSSION: As revisions of educational software are constantly being undertaken in response to field test and teacher evaluations, it is essential that the version of the package be indicated. Evidence of revisions illustrates the producer's commitment to a good product and often there have been significant improvements in the revised edition of an educational software package.

Unfortunately, different producers use different means to indicate when a package was developed or whether it has undergone any revisions.

In some cases, a newly updated catalogue will indicate new or revised releases from a company. In some packages, the inside page of the documentation provides a copyright date. In others, a version number such as 3.3 is indicated on the diskette label and/or on the title page of the actual software program. In addition, "revised edition", "expanded" or "updated version" can be used and in some cases, there is no indication at all of the date or version of the package.

It is recommended that the EDITION field should be designated by a version number or the verbal comment used by the producer such as "revised edition", "expanded" or "updated version".

Copyright date would not be used in the EDITION field, but would be entered in the DISTRIBUTION DATE field. If the package is a first version, the EDITION field should be left blank.

EXAMPLE:

PACKAGE TITLE: Milliken Math Sequences

EDITION: Revised Version

FIELD NAME: INTERNATIONAL STANDARD PROGRAM NUMBER
(ISPN)

DISCUSSION: The question of the need and feasibility of an international numbering system for books was first discussed at the third International Conference on Book Market Research and Rationalization in the Book Trade held in November, 1966 in Berlin. At that time a number of publishers and book distributors in Europe were considering the use of computers in order processing and inventory control and it was evident that a prerequisite of an efficient machine system was a unique simple identification number for a published item.

Undoubtedly, a similar system for computer programs is advisable. This system would uniquely identify each published program and serve to clearly distinguish similar programs. The International Microcomputer Software Directory designates each entry with an ISPN (International Standard Program Number). Their authority in this regard has not yet been determined. However, inquiries of the publisher (Imprint Software) have been made regarding both authority and procedures for application of such a number. The problem of this assignment is addressed in the document outlining MARC format for machine readable data files:

"Bibliographic Control Numbers and Codes:

The assignment of "standard" control numbers like an International Standard Book Number (ISSN) to machine-readable data files is a problem that requires further investigation. Under what circumstances would an ISBN, an ISSN, a yet-to-be-determined standard MRDF (machine readable data file) number, or a combination of these be used? The existing or proposed standard numbers have slightly different criteria for assignment as described below:

ISBN: The assignment is based on a type of entity (language material, general), a level (monograph), and variations of the printed format.

STRN: (Standard Technical Report Number) The assignment is based on a (sub) type of entity (language material, technical report) regardless of its format (printed, microform, etc.).

ISSN: The assignment is based on the level (serial) regardless of the format (printed, microform, etc.).

If a standard number were created for MRDF, would it apply to the format (machine-readable), or to the entity (language material, or numeric/software)? Level also has to be considered since there is already a precedent with the ISSN to assign a number to a "serial" regardless of its format (which could be machine-readable)."

The treatment of public domain software in this regard would be different, since no publisher is involved. Designation of such a number might be made by the province from which this software (public domain) originates.

EXAMPLE:

1. ISPN: PEI 132
2. ISPN: ALT 073

FIELD NAME: AUTHOR

DISCUSSION: Developers of commercially available courseware are often teams of professionals which include curriculum development and instructional design experts, subject area specialists, and computer programmers. For this reason, the name of the author or authors may not be acknowledged and this field will be left blank. The producer should not be designated as the AUTHOR in these cases.

In public domain software, the developer is generally one person, the author. The development of a software package is beginning to be accepted as a publication and therefore it is essential that wherever possible, the author's name should be included in the record. The AUTHOR field should indicate the full name of the author(s) responsible for the intellectual content of the package. Because of updating problems, contact information for the author should be sought through the producer (for whom contact information will always be given as part of the PRODUCER field).

EXAMPLE:

1. AUTHOR: Denis Simair
2. AUTHOR: Creative Education Consortium

FIELD NAME: PRODUCER

DISCUSSION: The PRODUCER field is intended to name and give contact information for the individual or organization - commercial or non-commercial - with the administrative responsibility for the production or development of the software. The producer may be an established publisher of educational materials such as SRA or it may be a small school district which has commissioned a local teacher to develop a scheduling package and is now making it available to others at cost.

In cases where the author is responsible for production, his or her name should be repeated in this field.

EXAMPLE:

PRODUCER: Hartley Courseware, Inc., P.
O. Box 431, Dimondale, Michigan, 48821
(616) 942-8987

FIELD NAME: DISTRIBUTOR*

DISCUSSION: This field provides the user with contact information required in order to acquire a program or package. The name, address and, where possible, the phone number of the distributor should be designated.

A distributor is defined as that organization which has been designated by the author or the producer to reproduce or distribute copies of a package or program. In cases where one company has the exclusive right to distribute a package in Canada, the name and contact information should be provided in the DISTRIBUTOR field.

If a distributor is not cited, it is assumed that:

- the author or producer is fulfilling this function (users should refer to the PRODUCER field for contact information)
- individual provinces have negotiated distribution rights (users should refer to the PRODUCER field for contact information)*
- numerous distributors exist; the statement, "Local Dealers" should be entered in the DISTRIBUTOR field

EXAMPLE:

1. DISTRIBUTOR: JEM Research,
Discovery Park, University of
Victoria, P. O. Box 1700, Victoria,
B. C., V8P 4W2 (604) 477-7246
2. DISTRIBUTOR: Local Dealers

*This is an example of a field which may vary in content from province to province. For instance, British Columbia may want to enter PEMC as the distributor for MECC materials. This would not be appropriate for Ontario. Discussion with designers of the eventual delivery system should consider the accommodation of provincial uniqueness in this field.

FIELD NAME: COPYRIGHT DATE*

DISCUSSION: The COPYRIGHT DATE is defined as the year the package became available for distribution to the public. This field was deemed necessary in order to provide an indication of the state of the art of hardware development and programming tools at the time of the release of the package. It should also assist users in determining a specific version of the package.

EXAMPLE:

COPYRIGHT DATE: 1981

FIELD NAME: RESTRICTIONS*

DISCUSSION: Teachers with limited budgets for the purchase of educational software will be very interested in acquiring or purchasing software which is copyable and alterable. Public domain software is copyable although some authors stipulate that the original program remain unaltered.

School districts have commissioned the development of programs and have authorized its teachers to make as many copies as required.

Provinces and school districts have purchased the right to copy software from organizations such as MECC as a cost effective means of ensuring packages for their schools.

It is important for teachers to be aware of which packages can be copied after an initial purchase, which are free of charge, and which can be altered.

It is therefore recommended that a RESTRICTIONS field be included to indicate whether the developer has given legal permission to copy or alter a program. This field would contain any combination of the following comments regarding restriction information:

Not Copyable
Not Alterable
Consult Producer
None

EXAMPLE:

1. RESTRICTIONS: Consult Producer
2. RESTRICTIONS: None

FIELD NAME: COST*

DISCUSSION: The COST field is essential since in many cases, software selection will be influenced by the prices of packages that offer similar features.

The COST field should include the exact price of all components as specified by the producer rather than by the distributor as prices will vary from one to the other. The amount should specify whether U.S. or Canadian funds and should also include the cost of back-up copy or warranty. It is important to note that this information will, more than likely, change from year to year and should always be verified by a potential purchaser.

In cases where a single program on a diskette is being described as in much of the MECC material, the price should refer to the total package cost.

As it can be assumed that the acquisition of public domain software is the responsibility of the teacher, no costs can be indicated but the COST field should identify the particular package as being "public domain."

EXAMPLE:

COST: \$625 U.S., Replacement diskettes -
\$10 U.S.

FIELD NAME: COMPUTER MODEL*

DISCUSSION: Educational software designed for one computer system will not run on another. Therefore, it is essential that educators be provided with exact information regarding the type of computer, including any model designation, that the software has been designed to run on.

In the software selection process, a list of educational software which is compatible with specific computer systems is very useful. In a print catalogue, the listing of software packages designed for the same computer system is often the major organizing principle. In an automated system which allows on-line searching, the specification of computer model would be, for many users, the first step in limiting the search.

When a package will run on more than one machine, a number of other fields of information may be affected (OPERATING SYSTEM, MEMORY, STORAGE MEDIUM, LANGUAGE, COST, EDITION, etc.). A single record which attempts to give all combinations of this information may prove too awkward. It is recommended, therefore, that an input form designed to be completed by producers should be set up in such a way that these variable fields can be easily accommodated according to type of machine. It is also recommended that separate records (one for each type of machine upon which the material will

run) be generated. This procedure should be verified by consultation with the technical experts of the delivery system who should be able to make comments regarding the respective efficiency, economy and usefulness of three separate records vs one conglomerate record.

EXAMPLE:

COMPUTER MODEL: TRS-80 Model III

FIELD NAME: MEMORY*

DISCUSSION: The MEMORY field refers to the minimum amount of internal or main memory required to run a program. This information is essential to teachers as a program developed to make full use of a 48K memory will not run on a 32K system.

EXAMPLE:

MEMORY: 48K

FIELD NAME: OPERATING SYSTEM*

DISCUSSION: A computer's operating system provides an interface between the user, the educational software, and the hardware. Operating systems for some models of computers have been expanded and revised recently, and therefore, it is important to indicate under which version of the operating system an educational program has been developed.

EXAMPLE:

OPERATING SYSTEM: NEWDOS

FIELD NAME: LANGUAGE*

DISCUSSION: A program written in one language or in one version of a language will not run unless a hardware system supports the specific language or version of the language in which the program was written.

For example, Apple II BASIC is different from TRS-80 or Commodore PET BASIC. Furthermore there are two versions of Apple's BASIC - Applesoft and Integer - and programs written in Applesoft BASIC will not run on Apples which have only the Integer version of the BASIC language unless a firmware card or Applesoft software is purchased.

Therefore, it is essential that teachers be provided with information regarding the specific version of the language used to develop a program.

EXAMPLE:

LANGUAGE: Applesoft BASIC

FIELD NAME: STORAGE MEDIUM*

DISCUSSION: The STORAGE MEDIUM field refers to the material on which the data are recorded. This field is essential to ensure that the medium on which the educational software is recorded is compatible with the user's hardware system and preference.

Entries in this field may include the following:

tape cassette
magnetic tape
ROM cartridge
punched cards
hard disk
aperature cards
5" 1/4 floppy
punched paper tapes
8" floppy
disk pack
other
mark sense cards

EXAMPLE:

STORAGE MEDIUM: 5 1/4" floppy diskette

FIELD NAME: DESCRIPTORS

DISCUSSION: This field represents the source of keywords or controlled vocabulary terms. These terms might represent several characteristics of the package, but they should, first and foremost, indicate subject content. The lack of specificity inherent in traditional subject heading systems (Library of Congress, Sears) makes this a desirable field.

The exact number of terms need not be standard. The topics covered by one package may exceed those covered by another. Thus, the DESCRIPTORS field of a very simple math package might contain the subject terms MATHEMATICS, ADDITION, SUBTRACTION whereas the DESCRIPTORS field for a more comprehensive package might include MATHEMATICS, ADDITION, SUBTRACTION, MULTIPLICATION, DIVISION, RATIO, PERCENT, and FRACTIONS.

Consideration should also be given to designating descriptors which indicate, for instance, instructional strategy, hardware, grade level, etc. Further study and consultation with specialists needs to address the following issues:

1. If PRECIS-like strings of terms are used, is this the logical field in which to include them?
2. If PRECIS-like strings are used, can they accommodate non-subject or

content terms (indications are that they can) and, if so, can/should fields which previously conveyed this information be eliminated from the record (i.e. INSTRUCTIONAL STRATEGIES, GRADE LEVEL)?

3. How can the task of generating a thesaurus or authority file, from which these terms would be selected, be best managed?

Because of the subjectivity involved in the selection of index terms (descriptors) and because an optimum degree of consistency of these terms is desirable for effective information retrieval, it is recommended that application of descriptors be done centrally.

EXAMPLE:

DESCRIPTORS: Language Arts. Grammar.
Comma

FIELD NAME: PERIPHERALS*

DISCUSSION: Peripherals are input/output devices which are used in combination or in conjunction with the computer but are not part of the computer itself. Educational software can be developed which requires specific peripheral devices. Therefore, it is essential that all peripheral devices required to use the program or package be listed. This field should distinguish between required and optional peripherals by the use of a parenthetical statement after the appropriate peripherals. (See example)

There are potential inconsistencies when providing information for this field. The Commodore PET has an integral monitor and it is not appropriate to list it as a peripheral device. However, some programs developed for the Apple II require the use of a colour T.V. or monitor. In this case, "a colour T.V. or monitor" would be listed as a peripheral device.

Because of the variety of models of peripheral devices on the market, particularly for the Apple II, an exact description of the device is most useful. For example, rather than listing "printer", the PERIPHERAL field might specify "an EPSON American MX80 printer." However, economy of record length precludes such detail. Users should be made aware that the nature of specific

peripherals should be investigated before purchasing a package.

The following provides a list of the various peripheral devices that might be included in this field:

colour T.V. or monitor
cassette player
black and white T.V. or monitor
tape activator
printer
audio cassette player
music synthesizer
paddles
Supertalker
light pen
Speechlink
plotter
disk drive
card reader
2 disk drives
Corvus network

EXAMPLE:

PERIPHERALS: 1 disk drive, 1 music synthesizer (required); 1 printer (optional)

FIELD NAME: CLASSIFICATION

DISCUSSION: In order to provide for integration of educational software with the various organization schemes used for educational resources, it is recommended that the following classification be applied:

Dewey Decimal Number
Library of Congress Classification Number
Sears Subject Heading

This application would be done by a central clearinghouse and should present few problems since the actual subject content of most software is very similar. It should not be difficult to derive a list of Dewey Decimal numbers, Library of Congress numbers, and Sears headings appropriate to the various (but limited at this point) topics covered by educational software. This should be verified through consultation with specialists in library science.

EXAMPLE:

1. PACKAGE TITLE: Milliken Math
Sequences
CLASSIFICATION: DDN-511; LC- ;
SEARS - Mathematics

2. PACKAGE TITLE: Hand-Holding BASIC
CLASSIFICATION: DDN-001.64; LC- ;
SEARS - a) BASIC (Computer program
languages) b) Programming Language
(Electronic computers)

FIELD NAME: APPLICATION

DISCUSSION: For the purpose of identifying programs which have been designed to fulfill specific purposes and to extend the usefulness of the database to include all computerized materials which might be of use to educators, an APPLICATION field is recommended. This field will further assist teachers in locating packages which cannot be searched under specific subject areas or grade levels.

Such a field may include the following categories of applications:

CAI
CMI
CAI/CMI
teacher aid
authoring aids
programming utilities
computer assisted testing
administrative aid
information processing
Computing Science
Computer Literacy
other

The majority of educational software would be included in the "CAI" application category. A package such as SRA's Classroom Management System would be assigned to the CMI category whereas Milliken's Comprehension Power would be included as CAI/CMI as it contains a management system and CAI programs. CAI

programs which contain record keeping facilities for student performance should not be included as computer managed instruction.

"Teacher aid" includes those packages such as crossword puzzle generators in which teachers input their own data into a "shell" of a program.

"Authoring aid", includes packages such as authoring languages or Apple's The Shell Games which enable teachers to author their own educational program without having to know a programming language.

"Programming utility" includes packages such as Dakin 5 or MECC 's Shape Tables which provide programming teachers and students with tools for writing programs more effectively or efficiently.

"Computer assisted testing" includes programs which have been designed to use the computer to determine a student's level of achievement. Computer assisted testing may also be considered an instructional strategy and may be entered in the INSTRUCTIONAL STRATEGY field.

"Administrative aid" includes attendance and scheduling packages which assist educators with administrative tasks in organizing student activities.

The "information processing" category includes packages such as word processors or data management systems which can be

used in the school office, in data processing courses or in business education classes.

"Computing Science" includes packages such as MECC's Introduction to Applesoft BASIC which is a tutorial to introduce students to the BASIC program language for the Apple II Plus.

Any programs which have been specifically designed for computer literacy such as SRA's Computer Discovery should be included in the Computer Literacy category.

EXAMPLE:

1. APPLICATION: CAI
2. APPLICATION: ADMINISTRATIVE AID

FIELD NAME: INSTRUCTIONAL STRATEGY

DISCUSSION: There are occasions when teachers will be searching for learning resources which fulfill a specific instructional need. For example, a teacher who has introduced and taught the concepts and skills involved in translating English units of measurement to metric units may be looking for a variety of materials which provide drill and practice to reinforce the teaching. In order to accommodate these instructional needs, an INSTRUCTIONAL STRATEGY field is recommended.

This field may include one or more of the following techniques or strategies:

drill and practice
tutorial
simulation
testing
problem solving
demonstration
educational game
other

Drill and Practice is a form of interactive computer assisted instruction in which students answer a series of questions presented to them. The computer provides feedback on whether an answer is correct or not. Depending on the complexity of the design, the computer may raise or lower the student to an appropriate level, keep track of

his performance through a management system, or branch into an information giving or tutorial session.

Tutorial programs usually provide information in the form of textual material with questions based on that material. Depending on the student's response, the program will branch to various options. Usually there is a lot of textual material.

Simulations are models of real life events, objects, or situations. In their simplest forms, they are demonstrations of how things look or work. In their more complex forms, they require student interaction and contain random events which add to the realism. They are useful when the real life situation would involve too much time, expense, or danger.

Testing by computer follows a similar format to drill or quiz programs without the correct answer being shown. The program can be designed to gather information about the validity of the questions and the effectiveness of the teaching.

Problem Solving packages encourage students to develop problem solving techniques and strategies by having them plan the steps and activities involved in reaching the solution to a particular problem. Terrapin's LOGO package would be considered a package to be used in teaching problem solving. There will be some overlap between problem solving packages and simulations but it can

generally be agreed that in simulations, the emphasis is on the content whereas in problem solving, the content is used to provide a context for the problem solving process.

Demonstration packages permit students or teachers to enter data which is used by the computer to demonstrate a concept or principle. An example of a demonstration package would be one in which polar coordinates are graphed.

Educational Game describes packages which provide instruction or drill in a game format in which the educational purpose is enhanced or accomplished through the use of the motivating and interest generating features of a game format.

EXAMPLE:

1. INSTRUCTIONAL STRATEGY: Testing
2. INSTRUCTIONAL STRATEGY: Drill and Practice, Testing

FIELD NAME: **GRADE LEVEL***

DISCUSSION: As the description in each package record is intended to provide a teacher with information to assist them in selecting packages which appear to be suitable for specific instructional or content needs, the grade level of the intended users is an important parameter in the selection process.

Most currently available educational software has been developed in the United States to satisfy the content and instructional needs of an American curriculum. It is being used by ten provinces and two territories who have no consistent guidelines for indicating which topics, skills and concepts are to be taught at which grade level and who are not talking about the same grade levels when they refer to an educational resource as being appropriate for "intermediate" or "junior" students. Therefore, an American company specifying that their package is suitable for Grade 4 or "junior" level students may not provide a Canadian teacher with accurate information.

There is no consistent method for developers to specify grade level. It is, therefore, recommended that the following arbitrary scheme be established as a guide in the designation of grade level:

Pre-school
Primary (K-3)
Intermediate (4-6)
Junior (7-9)
Senior (10-13)
Post-Secondary

Until the program is evaluated for local needs by trained subject area and grade level specialists, an accurate assessment of the intended grade use and actual suggested grade use appropriate to the respective provinces cannot be determined. It is also therefore recommended that teachers be advised that there will be inconsistencies and inaccuracies within this field and that the level of the intended user be treated as a broad description of the type of learner who would benefit most from the use of the package.

EXAMPLE:

GRADE LEVEL: Primary, Intermediate

FIELD NAME: SPECIAL USER

DISCUSSION: There are a number of packages which have been developed specifically for the use of special populations of learners. Since the use of the computer has been demonstrated as being effective and cost effective in the teaching of small populations of students with special needs, teachers of these students will be interested in locating packages which might be suitable for their students.

The descriptions included in this field may include the following special users:

physically handicapped
special education
vocational
adult basic education
second language instruction
English as a second language

In cases where a package has been developed for a specific type of student within one of the broad special user categories (i.e. a package for the Trainable Mentally Retarded), the broad category would appear in the SPECIAL USER field and the specific student would be mentioned in the abstract.

EXAMPLE:

SPECIAL USER: Vocational

FIELD NAME: ABSTRACT

DISCUSSION: One of the best sources for descriptive information of the package should be the ABSTRACT field. There are no universally accepted standards for writing an abstract and, consequently, the style and amount of information will vary from one source to another. While the writing of an abstract is a more subjective process than that of compiling a bibliographic citation, there is still a need for some type of intellectual control of descriptive elements to be included.

This control is most easily attained by utilization of two strategies:

- a) Provision of a list of topics of types of information to be provided when possible and where appropriate. The list should be logically organized and subdivided according to well-defined intellectual components.
- b) Provision for creation of each abstract to be done centrally (at a clearinghouse) in order to ensure:
 - standard format
 - standard vocabulary (This is particularly important since the abstract becomes an important field in an on-line search)
 - absence of subjective or evaluative comments

The ABSTRACT should be based on synopses and other information provided by producers (in the case of commercially distributed materials) and authors (in the case of public domain material).

The type of information provided in the ABSTRACT would include:

Components:

A listing of the entire contents of a package including support documentation (student and teacher manuals) and any additional support materials (audiocassettes, filmstrips)

Purpose:

A brief discussion of the intention of the package. Broad instructional objectives might be stated. This area might include reference to a specific user not mentioned in any other field (SPECIAL USER, GRADE LEVEL)

Topics:

Should indicate those topics within a curriculum subject addressed by the package

Process:

A brief description of what the program "does" and the strategy used to achieve the purpose of the package. This discussion may make reference to such characteristics as:

- type of student reinforcement
- type of student evaluation used (multiple choice, fill in blank)

- allowance for student or teacher specification (degree of difficulty, number of problems)
- use of graphics
- routine in error correction

Other:

Any other information not included above which distinguishes the package from others of its kind or which may prove useful to educators. This might include reference to computer/student ratio, implementation logistics, follow-up activities, and networking.

An ABSTRACT should not contain information available in other fields unless to indicate a greater degree of specificity (which is not possible in other fields).

EXAMPLE: See next page.

EXAMPLE:

PACKAGE TITLE: Preschool IQ Builder

Components

ABSTRACT: [This package consists of a four page manual and a diskette containing two related programs: 1) Same and Different; and 2) Letter Builder] [Its purpose is to help 3-6 year olds develop certain skills that will be used when they start school]

Purpose

Topics

[In Same and Different, drill and practice is provided in distinguishing between letters or letter-like patterns which are the same and patterns which are different. In Letter Builder, the child matches a letter on the screen with a letter on the keyboard] [In both activities, the drill becomes progressively more difficult, a record is kept of the child's progress, an incorrect answer is indicated by a beep and a correct answer is rewarded with a musical series of notes]

Process

FIELD NAME: EVALUATION STAGE

DISCUSSION: For reasons discussed earlier, a field which gives evaluative information is not appropriate in a descriptive database which, it is hoped, will be made available in the near future. However, if evaluative information is eventually made available, in a phased manner, then a field should reflect the EVALUATION STAGE at which the package may be currently designated.

The following represents recommendations for a phased evaluation procedure. The emphasis, in this context, has been to convey a sense of each stage in a general way. Individual characteristics of each stage are subject to further study and discussion.

Thus, the EVALUATION STAGE field of the Descriptive File might indicate a package to be at:

Stage 1:

- This designation would reflect entrance criteria which must be met in order for a package to be considered eligible for inclusion in the database. These criteria should stipulate that the package:
 - be educational;
 - be operationally ready to run;
 - be available for distribution;

- allowance for student or teacher specification (degree of difficulty, number of problems)
- use of graphics
- routine in error correction

Other:

Any other information not included above which distinguishes the package from others of its kind or which may prove useful to educators. This might include reference to computer/student ratio, implementation logistics, follow-up activities, and networking.

An ABSTRACT should not contain information available in other fields unless to indicate a greater degree of specificity (which is not possible in other fields).

EXAMPLE:

See next page.

EXAMPLE:

PACKAGE TITLE: Preschool IQ Builder

Components

ABSTRACT: [This package consists of a four page manual and a diskette containing two related programs: 1) Same and Different; and 2) Letter Builder] [its purpose is to help 3-6 year olds develop certain skills that will be used when they start school]

Purpose

Topics

[In Same and Different, drill and practice is provided in distinguishing between letters or letter-like patterns which are the same and patterns which are different. In Letter Builder, the child matches a letter on the screen with a letter on the keyboard] [In both activities, the drill becomes progressively more difficult, a record is kept of the child's progress, an incorrect answer is indicated by a beep and a correct answer is rewarded with a musical series of notes]

Process

- be free of glaring non-Canadian content (thereby eliminating, for example, a math package on Measurement which is not metric)

Stage 2:

- This designation would suggest that information concerning published evaluations is available in the Evaluative File. Cross-reference for these purposes might be to:
 - creditable evaluations by organizations which provide, on a regular basis, this type of evaluation (JEM, MicroSIFT, EPIE, Talmis);
 - evaluations published in the literature (The Computing Teacher, etc.)
 - field testing projects in progress - contact information might be made available
- The provision and maintenance of Stage 2 data could easily become a task of the central clearinghouse.
- It is not inconceivable that this information could appear in the Descriptive File. Further consideration needs to be given to this possibility.

Stage 3:

- This designation would suggest the completion of an extensive evaluation by subject specialists and trained evaluators using an instrument (or instruments) which has been mutually agreed upon by provinces and regions. Achievement

of this stage of evaluation will require:

- extensive research, discussion, and negotiation by provinces to select a suitable instrument;
- establishment of the most efficient and cost-effective system whereby the instrument may be applied
- further study to investigate how the results of such evaluation might best be implemented, shared, stored, and displayed.

Stage 4:

- This designation would be used by provinces to indicate whether material meets authorized or prescribed standards for an individual province.

It is recommended that one of the uses to which extensive evaluations such as those represented by Stage 3 might be put is to verify information found in the Descriptive File. This represents the most reliable method of maintaining the currency and integrity of the database.

EXAMPLE:

EVALUATION STAGE: 1

FIELD NAME: DISPLAY LANGUAGE

DISCUSSION: Although educational software in French is currently difficult to find (most of the existing French material is public domain and teacher written, often adapted from English programs), this subset of the entire collection of educational software is of special interest to Quebec, New Brunswick, and Manitoba, where substantial French populations exist. It is also of potential benefit to provinces offering French Immersion programs (an increasingly popular trend). For this reason, provision should be made for designation of the language displayed by an educational software package.

It may be possible to include this information in the ACCESSION NUMBER field (i.e. FR 12345 or EN 12345). Consultation with the delivery system will verify the more efficient approach.

EXAMPLE:

DISPLAY LANGUAGE: English

3.4 Sample Display Formats

This section gives examples of various display formats appropriate for different users and purposes. An automated database will allow an infinite amount of manipulation of fields. The following formats represent some displays which may be more commonly requested.

- Format 1 - field names are not abbreviated
 - sample of package subjected to standard description
 - inappropriate fields are left blank
 - long abstract is used
- Format 2 - complete database - type record
 - field names are abbreviated
 - inappropriate fields do not show in record
 - long abstract is used
- Format 3 - short display appropriate for students
 - short abstract is used
- Format 4 - short display appropriate for librarians
 - short abstract is used
- Format 5 - short display appropriate for teachers
- Format 6 - short display of system requirements
- Format 7 - short display of instructional information
- Format 8 - short display appropriate for browsing an initial set of documents in order to determine whether a fuller description should be examined

Format 9 - print catalogue entry
- field names do not appear

Field Abbreviations

AN - ACCESSION NUMBER
PT - PACKAGE TITLE
ST - SERIES TITLE
ED - EDITION
IS - ISPN
AU - AUTHOR
PR - PRODUCER
DI - DISTRIBUTOR
CD - COPYRIGHT DATE
RE - RESTRICTIONS
CO - COST
CM - COMPUTER MODEL
ME - MEMORY
OS - OPERATING SYSTEM
LG - LANGUAGE
SM - STORAGE MEDIUM
PE - PERIPHERALS
DE - DESCRIPTORS
CL - CLASSIFICATION
AP - APPLICATION
IN - INSTRUCTIONAL STRATEGY
GL - GRADE LEVEL
SU - SPECIAL USER
AB - ABSTRACT
ES - EVALUATION STAGE
DL - DISPLAY LANGUAGE

Format 1

ACCESSION NUMBER: 12345

PACKAGE TITLE: Comprehension Power
Program

SERIES TITLE: Comprehension Power
Program (Levels D-L)

EDITION:

AUTHOR:

ISPN: 1374-17-9

PRODUCER: Milliken Publishing Co.,
Inc.
1100 Research Boulevard
St. Louis, MO 63132
(314) 991-4220

DISTRIBUTOR: Local dealers

COPYRIGHT DATE: 1981

RESTRICTIONS: Not copyable
Not alterable

COST: Single level \$150 U.S.
3 levels (12 diskettes)
\$425 U.S.
3 levels with backup \$635
U.S.

COMPUTER MODEL: Apple II Plus

MEMORY: 48K

OPERATING SYSTEM:	DOS 3.3
LANGUAGE:	Applesoft BASIC
STORAGE MEDIUM:	5 1/4" floppy diskette
PERIPHERALS:	Printer (optional)
DESCRIPTORS:	LANGUAGE ARTS, READING COMPREHENSION, MANAGEMENT SYSTEM, DRILL AND PRACTICE, INTERMEDIATE, JUNIOR, SENIOR
CLASSIFICATION:	DDN-428; LC- ; Sears - English Language - Computer Programs
APPLICATION:	CAI/CMI
INSTRUCTIONAL STRATEGY:	Drill and Practice
GRADE LEVEL:	Intermediate, Junior, Senior
ABSTRACT:	The Comprehension Power Program is made up of nine sets of diskettes. The sets span reading levels four through twelve and are coded by letter, i.e. D-(level 4), E-(level 5), etc. Each set is made up of four diskettes containing twelve Comprehension Power Lessons. Each diskette contains three levels and a Manager Program. Each level can be purchased individually or in a set of three. The intent of the developers is to provide an inductive,

global reading experience. The Program provides managed drill and practice in 25 major reading comprehension skills through levels of increasing difficulty. Five major skill areas are developed: Literal Understanding, Interpretation, Analysis, Evaluation, and Appreciation. Each lesson consists of three parts: a review of new vocabulary, a teacher controlled preview of the selection, and comprehension questions based on a reading of a selection at a teacher or student specified reading rate and level. The management system enables teachers to individualize progress, to allow students to work independently, and to analyze specific skill areas. Feedback is provided through textual comments or optional animated graphics.

EVALUATION STAGE:

1

DISPLAY LANGUAGE:

English

Format 2

- AN - 12345
- PT - Comprehension Power Program
- ST - Comprehension Power Program (Levels D-L)
- IS - 1374-17-9
- PR - Milliken Publishing Co., Inc; 1100 Research
Boulevard; St. Louis, MO, 63132; (314) 991-4220
- DI - Local Dealers
- CD - 1981
- RE - Not copyable; not alterable
- CO - Single level (4 diskettes) \$150 U.S.; 3 levels (12
diskettes) \$425 U.S.; 3 levels with backup (24
diskettes) \$635 U.S.
- CM - Apple II Plus
- ME - 48K
- OS - DOS 3.3
- LG - Applesoft BASIC
- SM - 5 1/4" floppy diskette
- PE - Printer (optional)
- DE - LANGUAGE ARTS, READING COMPREHENSION, MANAGEMENT
SYSTEM, DRILL AND PRACTICE, INTERMEDIATE, JUNIOR,
SENIOR
- CL - DDN-428; LC- ; Sears - English Language - Computer
Programs
- AP - CAI/CMI
- IN - Drill and Practice
- GL - Intermediate, Junior, Senior
- AB - The Comprehension Power Program is made up of nine
sets of diskettes. The sets span reading levels
four through twelve and are coded by letter, i.e.
D-(level 4), E-(level 5), etc. Each set is made up
of four diskettes containing twelve Comprehension
Power Lessons. Each diskette contains three levels
and a Manager Program. Each level can be purchased
individually or in a set of three. The intent of
the developers is to provide an inductive, global
reading experience. The Program provides managed
drill and practice in 25 major reading

comprehension skills through levels of increasing difficulty. Five major skill areas are developed: Literal Understanding, Interpretation, Analysis, Evaluation, and Appreciation. Each lesson consists of three parts: a review of new vocabulary, a teacher controlled preview of the selection, and comprehension questions based on a reading of a selection at a teacher or student specified reading rate and level. The management system enables teachers to individualize progress, to allow students to work independently, and to analyze specific skill areas. Feedback is provided through textual comments or optional animated graphics.

ES - 1
DL - English

Format 3 - Students

- AN - 12345**
- PT - Comprehension Power Program**
- PE - Printer (optional)**
- IS - 1374-17-9**
- AB - This series provides drill and practice in reading comprehension for students at Intermediate through Senior levels. Each lesson reviews new vocabulary, provides a reading selection and appropriate comprehension questions. Student progress may be recorded.**

Format 4 - Librarians

AN - 12345
PT - Comprehension Power Program
ST - Comprehension Power Program
IS - 1374-17-9
PR - Milliken Publishing Co., Inc; 1100 Research
Boulevard; St. Louis, MO, 63132; (314) 991-4220
DI - Local Dealers
CD - 1981
CM - Apple II Plus
ME - 48K
OS - DOS 3.3
LG - Applesoft BASIC
SM - 5 1/4" floppy diskette
PE - Printer (optional)
DE - LANGUAGE ARTS, READING COMPREHENSION, MANAGEMENT
SYSTEM, DRILL AND PRACTICE, INTERMEDIATE, JUNIOR,
SENIOR
CL - DDN-428; LC- ; Sears - English Language - Computer
Programs
AB - This series provides drill and practice in reading
comprehension for students at Intermediate through
Senior levels. Each lesson reviews new vocabulary,
provides a reading selection and appropriate
comprehension questions. Student progress may be
recorded.

Format 5 - Teachers

- AN - 12345
- PT - Comprehension Power Program
- CD - 1981
- CO - Single level (4 diskettes) \$150 U.S.; 3 levels (12 diskettes) \$425 U.S.; 3 levels with backup (24 diskettes) \$625 U.S.
- DE - LANGUAGE ARTS, READING COMPREHENSION, MANAGEMENT SYSTEM, DRILL AND PRACTICE, INTERMEDIATE, JUNIOR, SENIOR
- AB - This series provides drill and practice in reading comprehension for students at Intermediate through Senior levels. Each lesson reviews new vocabulary, provides a reading selection and appropriate comprehension questions. Student progress may be recorded.

Format 6 - System Requirements

AN - 12345
PT - Comprehension Power Program
CM - Apple II Plus
ME - 48K
OS - DOS 3.3
LG - Applesoft BASIC
SM - 5 1/4" floppy diskette
PE - Printer (optional)

Format 7 - Instructional Information

- AN - 12345**
- PT - Comprehension Power Program**
- ST - Comprehension Power Program**
- AP - CAI/CMI**
- IS - 1074-17-9**
- GL - Intermediate, Junior, Senior**
- AB - This series provides drill and practice in reading comprehension for students at Intermediate through Senior levels. Each lesson reviews new vocabulary, provides a reading selection and appropriate comprehension questions. Student progress may be recorded.**

Format 8 - Browsing

AN - 12345
PT - Comprehension Power Program
DE - LANGUAGE ARTS, READING COMPREHENSION, MANAGEMENT
SYSTEM, DRILL AND PRACTICE, INTERMEDIATE, JUNIOR,
SENIOR

FORMAT 9 - Print Catalogue Display

PACKAGE TITLE: Comprehension Power Program

SERIES TITLE: Comprehension Power Program
(Levels D-L) 1981

LANGUAGE ARTS, READING COMPREHENSION, MANAGEMENT SYSTEM,
DRILL AND PRACTICE, INTERMEDIATE, JUNIOR, SENIOR.

The Comprehension Power Program is made up of nine sets of diskettes. The sets span reading levels four through twelve and are coded by letter, i.e. D-(level 4), E-(level 5), etc. Each set is made up of four diskettes containing twelve Comprehension Power Lessons. Each diskette contains three levels and a Manager Program. Each level can be purchased individually or in a set of three. The intent of the developers is to provide an inductive, global reading experience. The program provides managed drill and practice in 25 major reading comprehension skills through levels of increasing difficulty. Five major skill areas are developed: Literal Understanding, Interpretation, Analysis, Evaluation, and Appreciation. Each lesson consists of three parts: a review of new vocabulary, a teacher controlled preview of the selection, and comprehension questions based on a reading of a selection at a teacher or student specified reading rate and level. The management system enables teachers to individualize progress, to allow students to work independently, and to analyze specific skill areas. Feedback is provided through textual comments or optional animated graphics.

PRODUCER: Milliken Publishing Co., Inc.; 1100 Research
Boulevard; St. Louis, MO, 63132;
(314) 991-4220

DISTRIBUTOR: Local dealers

Not Copyable
Not Alterable

Single level \$15 U.S.
3 levels (12 diskettes)
\$425 U.S.
3 levels with backup \$635 U.S.

Apple II Plus
48K
DOS 3.3
Applesoft BASIC
5 1/4" floppy diskette
Printer (optional)

4.0 IMPLEMENTATION PLAN AND RECOMMENDATIONS

The work involved in providing a solution for educators to the problem of information dissemination regarding educational software can be divided into three phases:

Phase 1

- assess needs of educators
- research discipline involved
- define the problem
- generate a plan of action for further work

This report constitutes completion of Phase 1
Time Period Required - February 1982 - June 1982

Phase 2

- designate a body with the authority and mandate to make decisions and monitor further work
- complete a careful analysis of cost and implications and make necessary decisions regarding structure of a delivery system or set of procedures designed to collect and share information
- complete all support tasks required to establish working operating procedures involved in implementing the system

Tasks 1 - 20 as outlined on the Task Analysis chart in Section 4.3 of this report constitute Phase 2.
Estimated Time Period Required - Aug. 1982 - June 1983

Phase 3

- implement operating procedures of the system

- refine and change procedures where necessary
- produce first products of the system and distribute

This phase commences as soon as the processing of returned Input Forms begins. The phase is deemed completed with the production of the first print catalogue.

Estimated Time Period Required - June 1983 - Spring 1984.

4.1 Suggested Steps

The following outlines, in sequence, steps which should be taken to facilitate the exchange of information about educational computing in general and educational software in particular. Included in this implementation plan are current recommendations, as well as steps for further study (additional phases).

Implicit in the plan of action is the continued existence of an advisory committee (Project Review Committee) which assumes the initiative and responsibility for carrying out further action and research.

Following the detailed discussion of Suggested Steps are a Summary of Recommendations and a task and cost analysis.

The suggested steps are:

- 1) Determine procedures, funding, and coordination for establishing a central (national) authority, coordinating agency or clearinghouse to coordinate information dissemination regarding educational software.

Recommendation #1: That a Canadian Clearinghouse of Educational Software be established to complete the implementation plan outlined in this report.

The initial focus of such a Clearinghouse would be on educational software and should be extended at a later date, funds and resources permitting, to include information about:

- a) available literature relevant to educational computing;
- b) research in progress;
- c) existing educational computing practices, programs and projects;
- d) in-service training;
- e) curriculum development;
- f) activities of relevant organizations and individuals (a people resource file);
- g) evaluation;
- h) hardware;
- i) relevant conferences.

This information would be collected through published and unpublished sources, through the active solicitation of relevant documents and conference proceedings, and through the cooperation of the educational computing community.

Tasks of such a Clearinghouse would include:

- a) establishment and maintenance of a database of information;
- b) coordination of provincial or regional efforts in information dissemination;
- c) production of documents for distribution (reviews, reports, catalogues, directories, annotated bibliographies, a newsletter - all based on information collected for and included in the database);

- d) response to requests for information from educators at the public, secondary and post-secondary level;
- e) establishment of relations and information exchange with non-Canadian groups and potential resources (i.e. MicroSift)

The following issues regarding establishment of such a clearinghouse should be carefully addressed:

- a) possible sources of funding such as Council of Ministers; boards or departments of education; clearinghouse - generated funds (royalties, sale of information products and services); faculties of education; commercial suppliers of educational hardware and software;
- b) the potential for provincial or regional cooperation and support;
- c) the potential for cooperation and support from present educational computing organizations (The usefulness of any clearinghouse is directly proportional to the cooperation of individuals and/or groups who could make relevant contributions. The success of such a clearinghouse would clearly depend on the degree of cooperation which might be attained);
- d) the precedents and experiences of similar clearinghouse concepts (MicroSift, ERIC, Alaska On-Line Resource Center, Softswap, Florida Center of Instructional Computing);
- e) existing information and computer networks or delivery systems which might be utilized by such a Clearinghouse in order to minimize initial set-up costs and eliminate duplication of already existing services (FORMAT/NFB, BRS, DIALOG, INFOMART, QL, CANOLE);

- f) candidates for establishing such a clearinghouse
- 2) The first task of the established clearinghouse should be to begin collecting standardized descriptions of educational software packages.

Recommendation #2: That a database of standardized educational software descriptions be established by the Clearinghouse in order to provide the basis for:

- a) a selection tool to aid educators in the purchase of educational software
- b) central cataloguing records

The term database, although it simply implies a collection of information, is intended here to eventually represent a computerized collection, capable of generating certain useful products such as print or on-line catalogues and library products. If records within the database can also provide library cataloguing records for educational software, then a single software package should only ever be catalogued once and this cataloguing record should subsequently be made available to anyone wishing to catalogue this material.

In order to create a database of records, a decision must be made regarding the content and structure required for each record.

- 3) Decide on data elements or fields to be used in describing educational software.

Recommendation #3: That the 26 fields as defined in Section 3.3 of this report constitute the basis for a standardized description of educational software.

- 4) Circulate suggested fields and rationales to computer-using educators for comments and possible subsequent revision.

This task might be accomplished in the following manner:

- a) generate a contact list of computer-using educators;
 - b) summarize fields and explanations;
 - c) design a survey instrument to measure attitude or response to b) which allows for additional comments;
 - d) circulate b) and c) to members of a) with a letter requesting their comments and cooperation;
 - e) collect and tabulate results;
 - f) make revisions where necessary to suggested fields.
- 5) Decide which materials are to be included in the software database.

The decision regarding inclusion of materials should be based on the following considerations:

- a) qualitative entrance criteria;

Recommendation #4: That all software materials described in the database should be:

- educational in nature
- operationally ready to run
- free of non-Canadian material which makes it inappropriate for Canadian students
- available for distribution in Canada

b) a phased inclusion of evaluative material;

Recommendation #5: That software material be subjected to 4 stages of evaluation.

Stage 1

- minimum entrance criteria as suggested in a) above;

Stage 2

- cross-reference to published evaluations available in the literature or from evaluation organizations;

Stage 3

- comprehensive evaluations by trained subject specialists using a standard evaluative instrument;

Stage 4

- designation of provincial authorization or prescription (See discussion of EVALUATION STAGE field in Section 3.3 of report for a more detailed explanation)

c) allowance for separate files within the

database;

Recommendation #6: That the database contain at least two separate files - a Descriptive File and an Evaluative File. Records for the Descriptive File should be given immediate priority.

- 6) Design an organizational scheme to collect descriptions of educational software.

Recommendation #7: That the cooperation of producers of commercial educational software be sought in the task of collecting descriptions about their products.

Recommendation #8: That the cooperation of provincial organizations of computer using educators (ECOO, AACE, etc.) or some other provincial or regional interest group be sought in the task of collecting descriptions of public domain software originating in their province.

Recommendation #9: That an Input Form and accompanying guide, based on the final list of agreed fields of an educational software description, be designed and distributed to the two groups mentioned above (producers and provincial groups) to ensure that all descriptions collected appear in a standard format.

Recommendation #10: That the Clearinghouse be responsible for collection, completion and initial processing of Input Forms, as well as encouraging ongoing submission of such forms.

Recommendations 7-10 might be best implemented in the following manner:

- a) Design an Input Form and guide to be circulated.
- b) Generate a list of commercial producers of educational software.
- c) Design a covering letter which:
 - introduces the notion of a database of software descriptions to be used as a selection tool in the purchase of commercial products;
 - encourages each producer to complete an Input Form for each of their educational software products which meets the initial entrance criteria (See Recommendation #3);
 - encourages the producer to complete and forward an Input Form for each product which becomes available in future;
 - lists incentives to the producer for their cooperation (potential sales volume increases by Canadian educators; higher product visibility; consideration for distribution arrangements; potential benefit from information in an Evaluative File; benefits from an intended print catalogue, etc.)
- d) Forward a "kit" to each producer containing the letter, a supply of Input Forms and guides, a producer profile information form to be completed by the producer, and a procedure for submission, further inquiry and support.
- e) Make contacts in each province with interest groups who would cooperate in the collection of public domain software descriptions. These groups would be responsible for:
 - identifying public domain software (or authors of same) generated and available within their province;

- circulating the standard Input Form to authors or other individuals knowledgeable enough about the software to complete the descriptions;
- ensuring that each description represented an example of educational software which satisfied the entrance criteria for the database;
- collecting Input Forms and forwarding to the Clearinghouse;
- encouraging the ongoing submission of Input Forms by authors of public domain software within the province.

Groups might accomplish the above through use of their newsletter as a means of contacting authors and software. Consideration might also be given to the establishment of provincial grants or funding in order to encourage speedy collection of information about already existing public domain materials, thus reducing the task of the interest groups to that of establishing structures for collection of information about newly and future produced public domain software only (rather than the archival collection or backlog already in existence).

This step establishes a procedure for a simple, organized, cooperative submission of descriptions of educational software. These completed forms represent the initial makings of a database. A decision must now be made about what to "do" with this information.

- 7) Decide what products are to be generated by the database.

Recommendation #11: That a print catalogue which can be used as a selection tool by educators and cataloguing records (in card or COM form) which can

be used by librarians to organize collected resources are the two products most urgently required at present.

Further work needs to be done to determine the actual structure and appearance of these two products. Representatives of the selected delivery system will need to be consulted and advised.

Recommendation #12: That with reference to the products designated in Recommendation #11, on-line cataloguing records and an on-line product catalogue constitute lower priorities in terms of immediate availability to educators but equal priority in terms of development and delivery system consideration.

It should be understood that if on-line capabilities are to be eventually utilized by educators that they should be planned for now, notwithstanding the fact that present educators are more likely to consult a print catalogue than an on-line catalogue and that school librarians are more likely to request catalogue cards for a library item than a search of an on-line union catalogue.

Paradoxically, a system which produces an on-line database of records can more efficiently supply the so-called manual products (print catalogue and catalogue cards) than a manual system. In effect, it is being suggested that an automated system be developed now with the capability of producing manual products until such time as the on-line capabilities of such a system can be more fully utilized.

- 8) Select a cataloguing code appropriate for educational software materials.

Recommendation #13: That the cataloguing rules for machine-readable data files, as set out in The Anglo American Cataloguing Rules (2nd edition) be adapted. Refer to Section 2.0 of this report for further discussion.

Further work needs to be done in order to determine the actual implications of AACR2 and MARC format. Areas still in question include:

- a) Adaptation of the 26 fields outlined in Section 3.3 of the report to AACR2 format;
- b) Possible consequent redefinition of some of the 26 fields as a result.

(Contacts have already been established with individuals who are both knowledgeable and willing to contribute their expertise and advice in this regard.)

- 9) Select an indexing method which is appropriate in both an on-line and manual search situation.

Recommendation #14: That a keyword indexing method be utilized and that serious consideration be given to a PRECIS-type management system of the keywords or descriptors.

Because the selection of an indexing method is so dependent on selection of a delivery system, it is not possible to phrase Recommendation #14 any more strongly.

- 10) Select a delivery system which:

- can create a database of descriptions of educational software, resident in Canada;
- can provide library cataloguing services;

- generate catalogue cards or COM;
- generate a quality print catalogue to be used as a selection tool;
- provide on-line access to database records;
- provide expertise, experience, and guidance in database creation;
- can accomodate PRECIS indexing - should this method be deemed appropriate;
- demonstrate the potential to accomodate additional files of information in an educational software database. (i.e. Evaluative File)

Recommendation #15: That detailed analysis be done to determine the cost, procedures and implications of a delivery system which makes use of the combined resources of the FORMAT program of the National Film Board, the PRECIS program resident at University of Toronto Library Automation Service (UTLAS), and the cataloguing services of UTLAS. See Figure 10 - A Possible Delivery System.

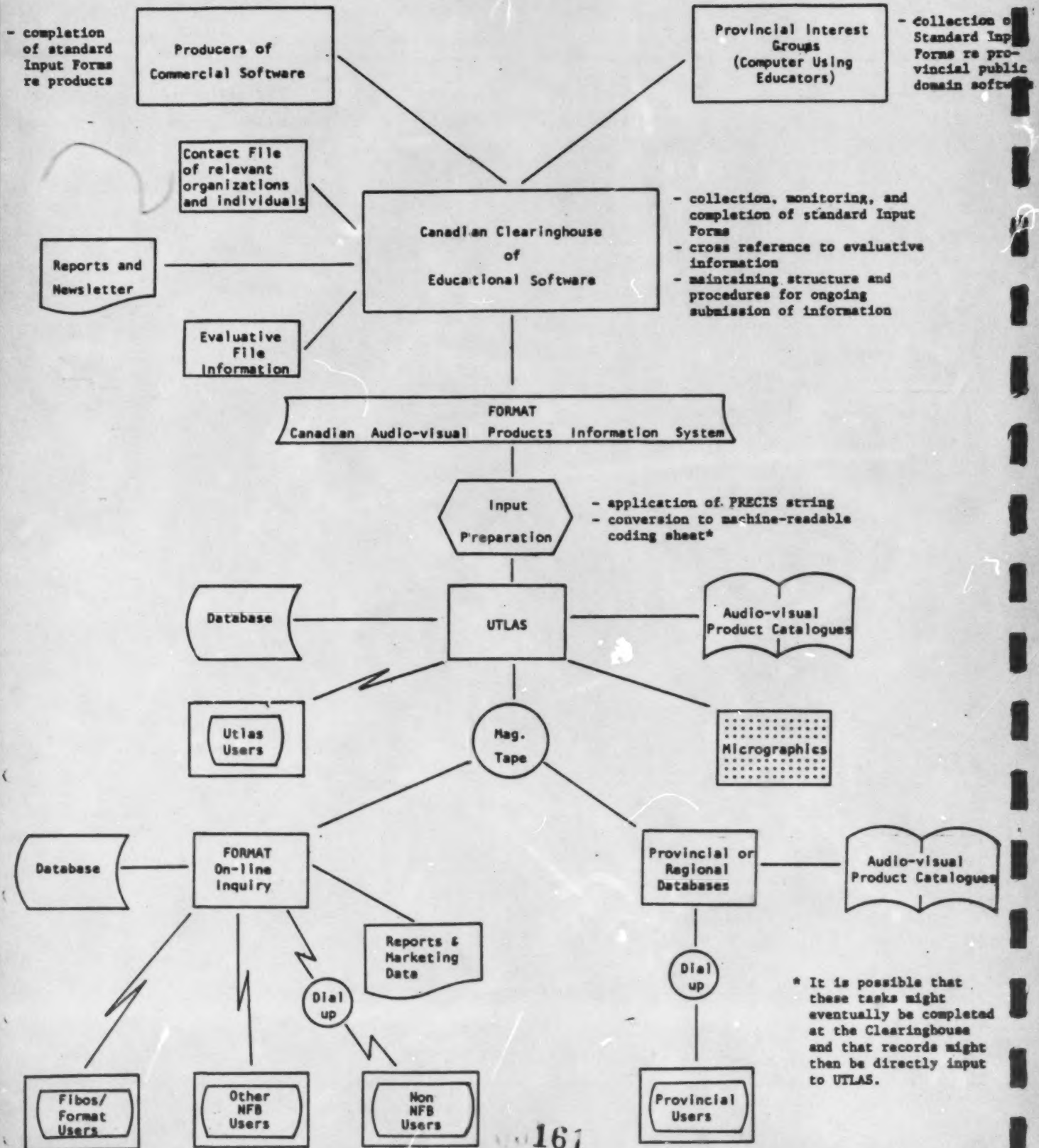
- 11) This study might best be initiated by a meeting which would include attendance by representatives of:
- a) the present steering committee - or individuals appointed by the committee (Project Review Committee);
 - b) the Clearinghouse;
 - c) National Film Board (FORMAT)
 - d) UTLAS
 - e) current users of PRECIS (York County School Board, ONTERIS)
 - f) current users of MARC format regarding machine-readable data files
 - g) the JEM Research Team

The agenda of such a meeting should provide a structure for discussion and negotiation regarding costs and procedures of the delivery system in

meeting the requirements of users of the database as represented by the Clearinghouse. It is also crucial that such a meeting address the problems posed by unique provincial and regional needs regarding library and print catalogue requirements.

Figure 10

A POSSIBLE DELIVERY SYSTEM



4.2 Summary of Recommendations

- #1 That a Canadian Clearinghouse of Educational Software be established.
- #2 That a database of standardized educational software descriptions be established by the Clearinghouse in order to provide the basis for:
 - a) a selection tool to aid educators in the purchase of educational software
 - b) central cataloguing records
- #3 That 26 fields as defined in Section 3.3 of this report constitute the basis for a standardized description of educational software.
- #4 That all software materials described in the database should be:
 - educational in nature
 - operationally ready to run
 - free of glaring non-Canadian content
 - available for distribution in Canada
- #5 That software materials be subjected to four stages of evaluation

Stage 1

- entrance criteria (see Recommendation #4)

Stage 2

- cross reference to published evaluations from various sources

Stage 3

- comprehensive evaluations

Stage 4

- optional provincial curriculum match to determine authorization or prescription designation

- #6 That the database contain a Descriptive File and an Evaluative File and that records for the Descriptive File be given immediate priority.
- #7 That the cooperation of producers of commercial educational software be sought in the task of collecting descriptions about their products.
- #8 That the cooperation of organizations of computer using educators (ECOO, AACE, etc.) or some other provincial or regional interest group be sought in the task of collecting descriptions of public domain software originating in their province.
- #9 That an Input Form and accompanying guide, based on the final list of fields, be designed and distributed to the producers and provincial groups to ensure that all descriptions collected appear in a standard format.
- #10 That the Clearinghouse be responsible for collection, completion, and initial processing of Input Forms, as well as encouraging submission of such forms.
- #11 That the database be capable of generating and delivering in the near future:
 - a) a print catalogue for use as a selection tool in the purchase of software
 - b) library cataloguing records to aid in the organization of software collections

#12 That the database be capable of generating and delivering at a later date:

- a) an on-line catalogue for educators and students
- b) on-line cataloguing records for librarians

#13 That AACR2 cataloguing rules be adapted.

#14 That a keyword indexing system be utilized and that serious consideration be given to a PRECIS-type management system of the keywords or description.

#15 That a delivery system comprised of FORMAT (National Film Board) and UTLAS (University of Toronto Library Automation Service) be analyzed in detail to determine cost, procedures and implications for a database of educational software.

4.3 Task Analysis

The foregoing discussion of necessary steps to be taken in a cooperative exchange of information about educational software suggests a number of individual tasks. The following Task Analysis chart (Figure 11):

- summarizes the list of specific tasks
- relates each task where appropriate to the corresponding Recommendation
- designates group/s responsible for completion of the task
- provides additional comments regarding resources and time required for completion of each task.

Figure 12 (Phases 1 - 3 Timeline) places the tasks outlined in Figure 11 in the context of the three Phases described at the beginning of Section 4.0 and presents suggested time periods required for each Phase and task within each Phase.

Figure 13 presents a cost analysis for work to be done in Phase 2. It should be noted that these costs do not include work involved in Activity #18 (Evaluation Procedures Study and Collection).

Figure 11

PRC = Project Review Committee
 CH = Clearinghouse
 DS = Delivery System

TASK ANALYSIS

Recommendation	Responsibility		
	PRC	CH	DS
1. Establish a committee which represents users within participating provinces or regions in a cooperative effort to address the educational software problem and whose mandate is to supervise and authorize future phases of work. (Project Review Committee - PRC)			
2. Determine procedures, funding, and candidates for establishing a Canadian Clearinghouse of Educational Software.	#1	X	
3. Decide on data elements or fields to be used in a standard description of educational software.	#2, #3	X	X
4. Circulate suggested fields and rationales to computer-using educators for comments and possible subsequent revision.		X	
5. Decide which materials are to be included in the software "database".	#4, #5, #6	X	X
6. Design an organizational scheme to collect descriptions of educational software.	#7, #8, #9, #10	X	X
7. Decide what products are to be generated by a database of educational software.	#11, #12	X	X
8. Select a cataloguing code.	#13	X	
9. Select an indexing method appropriate for manual and on-line searching.	#14	X	X
10. Select a delivery system.	#15	X	
11. Arrange a preliminary meeting with representatives of the delivery system and the Clearinghouse to discuss costs, procedures, and further steps.		X	X
12. Engage in ongoing consultation and negotiation with representatives of the delivery system in order to refine procedures.		X	X
13. Design an input form and guide to solicit standard descriptions of educational software.	#9		X
14. Establish liaison with and solicit cooperation of commercial producers of educational software in the collection of descriptions of their products.	#7	X	X
15. Establish liaison with and solicit cooperation of provincial educational computing groups in the collection of descriptions of public domain software.	#8	X	X
16. Detailed analysis including consultation with representatives of the delivery system regarding procedures for application of indexing method.	#14		X
17. Alignment of 26 fields in the standard description with MARC format for machine-readable data files.		X	X
18. Design, in conjunction with representatives of the delivery system, the Clearinghouse and the results of 16. and 17. above, a coding sheet to convert data from the input form to machine-readable coding.		X	X
19. Design of the print catalogue (including decisions regarding types of indexes and appendices likely to be useful to educators).		X	X
20. Design and approval of library cataloguing products (including decision regarding physical format, availability, access, etc.)		X	X

This step would fall under the jurisdiction of the present Steering Committee.

This step would represent the first required action of the PRC, established in 1. above and might best be met through a Request for Proposal procedure.

Represents a decision not requiring funding if recommendations are approved.

Two months (include survey and response time).

Represents a decision not requiring funding if recommendations are approved.

Represents a decision not requiring funding if recommendations are approved.

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Represents a decision not requiring funding if recommendations are approved.

Arrangements for this meeting should begin immediately after the establishment of the Clearinghouse.

This process should be continuous.

Two months (include consultation with delivery system, travel, and mail time).

Two months (include mailing time).

Four months (include travel, consultation and support expenses as well as allowance for mailing time).

Three months (this task may involve special consultant costs).

Two months (this task may involve special consultant costs).

One month (allow time for mail and revision process).

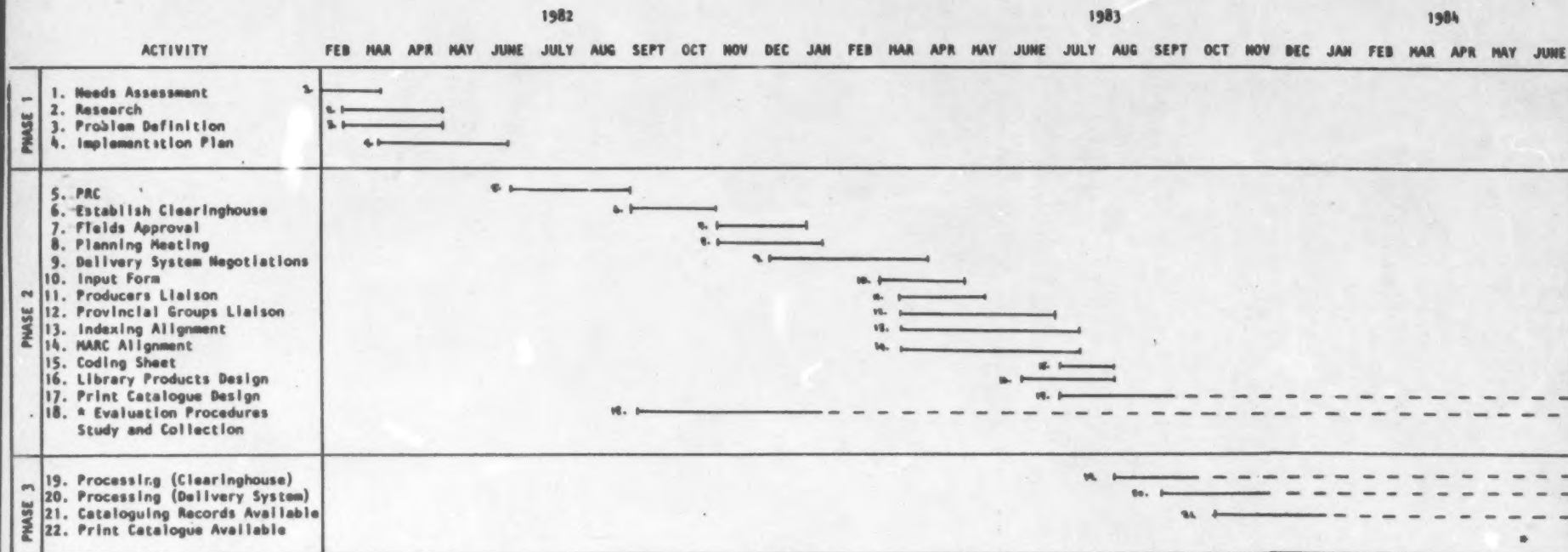
This task may span several months and will be ongoing until actual production of the print catalogue (Spring, 1984).

Cataloguing records should be available on-line as soon as the delivery system is operational and able to process input (September, 1983).

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Figure 12

PHASES 1 - 3 TIMELINE



* Re: Activity 18 (Evaluation Procedures Study and Collection) - This task analysis refers to work and time required in order to establish a database of descriptions of educational software. The collection of evaluative material concerning educational software can begin anytime after the establishment of the Clearinghouse. An implementation plan which introduces the working procedures or structure necessary for this collection has not yet been developed. Reference should be made to Recommendation #5 of this report which outlines 4 suggested stages of evaluation and to Section 3.3, which carefully defines these stages in the discussion of the EVALUATION STAGE field. If Recommendation #5 is accepted, the Clearinghouse can begin immediately upon its inception to collect published evaluations to be used in Stage 2 evaluations (literature cross reference) while the procedure and instrument for obtaining Stage 3 evaluations is being determined.

----- ongoing

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Figure 13

COST ANALYSIS FOR PHASE 2

Activities 7 through 17 of Phase 2 represent all support work necessary to have procedures and a delivery system set up and ready for processing of records by mid-summer of 1983. This work will be completed or coordinated by the Clearinghouse staff which should consist of a minimum of the following:

2 professionals representing expertise in:

- educational software
- database management
- information retrieval and dissemination
- resource or library procedures

1 clerical/secretarial

A cost analysis for these services for the period Nov. 1, 1982 (establishment of the Clearinghouse) to Aug. 1, 1983 (point at which actual processing of returned Input Forms may begin) follows:

	<u>Per Month</u> <u>(120 hrs)</u>	<u>9 Month Period</u>
2 professionals @ \$50.00/hr.*	\$12,000	\$108,000
1 clerical @ \$25.00/hr.	3,000	27,000
	<u>\$15,000</u>	<u>\$135,000</u>
15% for travel and expenses	2,250	20,250
	<u>\$17,250</u>	<u>\$155,250</u>

* Includes Overhead

COMPUTER CATALOGUING
AND
INDEXING SURVEY

Summary

by

JEM Research
Victoria, B.C.

July 1982

82-27

planning & research

Alberta
EDUCATION

170

INTRODUCTION

The 200-page report by JEM Research of Victoria, B.C., represents the culmination of four months of intensive research of both the field and literature about the state of information dissemination regarding educational software.

Included in the project is an analysis of educational software information available to educators, an assessment of needs as expressed by educators throughout Canada, and the generation of an implementation plan designed to make the two more congruent.

JEM Research, in this report, addressed the problems inherent in the collection, organization, and dissemination of information about educational software and suggested a structure for effectively accomplishing these activities. This Staff Summary combines the report's Executive Summary with the researchers' recommendations to the Ministries of Education of Alberta, British Columbia, New Brunswick, Northwest Territories, Nova Scotia, and Ontario.

PROCEDURE

In order to arrive at the recommendations, the nature of available information about educational software was examined with reference to quality, quantity, availability, and appropriateness.

Requirements (as expressed by educators at all levels across Canada) of a variety of users--teachers, students, librarians, resource personnel, and administrators--were considered.

The consensus was that current information capabilities--software catalogues, vendor publicity materials, and educational resource centers--do not satisfactorily meet the user needs.

Users expressed their opinions regarding the "state of the art" of information organization regarding educational software:

1. dissatisfaction with the present quality, quantity, and format of information;
2. frustration with the dearth of coordinated resource and information sharing among schools, boards, regions, and provinces;
3. certainty that educators' workloads and lack of funding preclude their ability to make a concerted effort to organize the information to meet their needs;
4. anger, in light of the lack of funding, at the duplication of work and expense in the few attempts to provide the information, the results of which are often inadequate;
5. concern that lack of easily-accessible information will inhibit and discourage the broader educational use of software, similar to the disenchantment with educational television;

6. desire for an authority to assume the initiative and provide the direction and funding required to remedy the problem and ameliorate the user concerns;
7. desire for real provincial cooperation in this matter (general pessimism exists, due to the political-educational structure).

Educators expressed their frustration that, although the most cost-efficient and least duplicative arrangement for information-sharing seemed to be provincial cooperation under a coordinating body, this kind of national coordination was not likely to happen. They were nevertheless eager to contribute to the survey and analysis, since the discussions provided, in many instances, an opportunity for representatives of very different disciplines to discuss common concerns in instructional computing.

SOFTWARE REQUIREMENTS

The requirements as stated by the representatives included:

1. thorough descriptions of available materials;
2. standard descriptions which could be easily understood by all users;
3. easily-accessible descriptions available in one catalogue or accessed through a database;
4. evaluations;
5. interface and comparability with descriptions of other educational resources.

Field discussions were most often concerned with two notions:

1. the desirable elements or fields of a standard description, and
2. the method of information gathering and dissemination.

Most people interviewed agreed that a centralized system of one sort or another would be the most effective, but questioned the possibility of a coordinated national effort, given the structure and history of educational responsibility in Canada.

Additionally, some individuals questioned the blanket applicability of a centralized system, given regional requirements, geographic inhibitors to full participation in such a system, and fears of unequal treatment of the "poorer" and less vocal provinces.

Literature on educational software organization is minimal, but literature on the treatment of non-print materials is abundant. Most of this literature underlines the importance of standardization and cooperation in all of data collection, format, and distribution. Both Great Britain and the United States have established major clearinghouses for reliable information about non-print educational resources.

Current computer technology enables networking by resource and information specialists. Networking implies a cooperation by people, groups, or sections in sharing effort and cost, while maintaining control over matters of individual concern. Networking is a compromise between the bureaucratic problems created by a central agency's attempting to perform all functions for all groups, and the expense of numerous organizations duplicating the same tasks on the same materials.

The establishment of an information-sharing network would be facilitated by the following steps:

1. Determine procedures and funding for the provision of some form of coordination of information dissemination activities regarding educational software.
2. Begin collecting standardized descriptions of educational software packages.
3. Decide on data elements or fields to be used in describing educational software.
4. Circulate suggested fields and rationales to computer-using educators for comments and possible revision.
5. Decide which materials are to be included in the software database.
6. Design an organizational scheme to collect descriptions of educational software.
7. Decide what products are to be generated by the database.
8. Select an appropriate cataloguing code.
9. Select an indexing method appropriate in both an on-line and manual search situation.
10. Select a delivery system which can:
 - a. create a database of descriptions of educational software;
 - b. provide cataloguing services;
 - c. generate catalogue cards or COM;
 - d. generate a quality print catalogue as a selection tool;
 - e. provide on-line access to database records;
 - f. provide expertise, experience, and guidance in database creation;
 - g. accommodate PRECIS indexing, if required;
 - h. accommodate additional files of information in an educational software database.
11. Analyze the cost, procedures, and implications of a delivery system using FORMAT, PRECIS, and UTLAS, by convening a meeting of the Steering Committee for this Stage 1 report, the coordinating agency, the users and holders of these three formats, users of MARC format, and the JEM research team.
12. Accommodate the use of both official languages in designing the information-sharing network.

RECOMMENDATIONS

The recommendations for a plan of action are based on two notions essential to the solution of the educational software information problem:

1. There should be a standard descriptive format which can be used to describe all educational software. This format should provide data relevant to the needs of all users--students, teachers, administrators, and resource personnel--and should conform to guidelines which anticipate or accommodate not only present, average examples but also future and exceptional examples.

In a standard description, 26 fields of information should be used:

Accession Number	Restrictions	Classification
Package Title	Cost	Application
Series Title	Computer Model	Instructional Strategy
Edition	Memory	Grade Level
ISPN	Operating System	Special User
Author	Language	Abstract
Producer	Storage Medium	Evaluation Stage
Distributor	Peripherals	Display Language
Copyright Date	Descriptors	

The researchers also suggest that cataloguing methods should include both library and vendor catalogues, as a library tool and as a purchase tool respectively. The information provided by the library catalogue would help the user determine:

- whether the collection contains a specific item;
- which works by a particular author are in the collection;
- which editions of a particular work are in the collection;
- what materials a collection has on a specific subject.

The researchers note problems school libraries currently have with the organization of non-print materials, such as:

- lack of a link between the classification system and an accession number;
- lack of full and comprehensive cataloguing cards;
- lack of a comprehensive, multiple-type classification system; and
- lack of consistent, uniform cataloguing codes.

Vendor catalogues should contain information about products available for purchase, but their usefulness is impaired by:

- insufficient information;
- questionable value judgements inherent in the subjective nature of each;
- inadequate indexing systems which require the reading of every description to determine appropriate material;
- lack of standard formats between and within catalogues, making comparison extremely difficult; and
- profusion of different catalogues.

A catalogue of educational software should:

- contain public domain and commercially-produced software;
- provide thorough, standard descriptions;
- indicate what educational software is currently available;
- be updated yearly;

- provide suitable indexing by subject;
- provide easily-understood indexing;
- provide information appropriate to decision-making on suitability, i.e., specifications, cost, availability, topics;
- be able to be produced economically and efficiently.

In addition, the researchers describe suitable indexing methods which should be adopted in establishing a network: library indexing, print catalogue indexing, ERIC, and PRECIS.

Materials in libraries are most often indexed by title, author, and a subject heading. This method can create problems as a result of the growing number of subject headings for such a rapidly-growing area as educational software:

- subject terms become outdated because of new educational jargon;
- terms may be too specific or not specific enough;
- "see" and "see also" references need to be continually updated, also, because of the growth in vocabulary.

Print catalogue indexing may be inadequate because of a lack of cross-referenced or comprehensive subject headings and subject, grade level, and hardware specifications.

ERIC has created its own vocabulary of keywords and a thesaurus, which provides an alphabetic listing of all terms. The thesaurus compares old and new terms, and provides a rotated descriptor display. The one drawback to ERIC is that it is designed for machine access, whereas at this time, the print catalogue is the most accessible.

PRECIS (Preserved Content Indexing System) produces a printed index for manual retrieval and accommodates the potential for machine access. PRECIS is a machine-produced alphabetical indexing system, based on a natural-language-based syntax. PRECIS seems most appropriate for present needs of users of educational software in that it:

- caters to both manual and machine retrieval systems;
- can be used to reflect Canadian terminology;
- has been utilized in bilingual applications;
- has readily available software in a Canadian system (UTLAS);
- has proven useful in indexing non-print materials generally and educational software specifically.

2. The system should

- a. at all times preserve the quality of these descriptions by rigorous adherence to standards, while compromising to accommodate unique requirements; and
- b. take advantage of the cost and effort economies derived from a cooperative network.

The 12-point system outlined above would involve cooperative collection and organization of information, and would be under the direction of a coordinating agency with two responsibilities:

- a. representation of all user needs, and
- b. maintenance of the quality and integrity of the standard descriptions which will form the database.

It is more than likely that these responsibilities will run counter to one another from time-to-time. However, a coordinating agency which is intimately involved in the generation of descriptions and the various needs of all users is the best vehicle to resolve conflicts of interest.

The major advantages of a coordinated information sharing effort accrue during the gathering and organizing of the information. The information can be easily disseminated by individual provinces or regions once they have the original, standardized data. This individuality would allow network participants to distribute information in the form which best accommodates their own educational resource requirements.

Recommendation 1: That a coordinating agency be designated to complete the 12-point implementation plan outlined above, and described in the JEM Research report.

Recommendation 2: That a database of standardized educational software descriptions be established in order to provide a basis for:

- a. a selection tool to aid educators in purchasing educational software; and
- b. central cataloguing records.

Recommendation 3: That the 26 fields described on Page 4 of this report constitute the basis for a standardized description of educational software.

Recommendation 4: That all software materials described in the database should be:

- a. educational in nature (relating to the fields of education, teaching, and schooling);
- b. operationally ready;
- c. free of non-Canadian material inappropriate for Canadian students;
- d. available for distribution in Canada.

Recommendation 5: That software material be subjected to a four-stage evaluation:

- a. minimum entrance criteria, as suggested in Recommendation 4;
- b. cross-reference to evaluations published in the literature or available from evaluation organizations;
- c. comprehensive evaluations by trained subject specialists using a standard evaluative instrument;
- d. designation of provincial authorization or prescription.

Recommendation 6: That the database contain at least two separate files--a Descriptive File and an Evaluative File. Records for the Descriptive File should be given immediate priority.

Recommendation 7: That the cooperation of producers of commercial educational software be sought in collecting descriptions about their products.

Recommendation 8: That the cooperation of provincial organizations of computer-using educators or some other provincial or regional interest group be sought in the task of collecting descriptions of public domain software originating in their provinces.

Recommendation 9: That an Input Form and accompanying guide, based on the final list of agreed fields of an educational software description, be designed and distributed to the producers and provincial groups to ensure that all descriptions collected appear in a standard format.

Recommendation 10: That the coordinating agency be responsible for collection, completion, and initial processing of Input Forms, as well as encouraging ongoing submission of such forms.

Recommendation 11: That a print catalogue which educators can use as a selection tool, and cataloguing records which can be used by librarians to organize collected resources be developed with the utmost urgency.

Recommendation 12: That, with reference to the products in Recommendation 11, on-line cataloguing records and an on-line product catalogue be developed with all speed. They constitute lower priority in terms of immediate availability to educators, but equal priority in terms of development and delivery system consideration.

Recommendation 13: That the cataloguing rules for machine-readable data files be adopted.

Recommendation 14: That a keyword indexing method be utilized and that serious consideration be given to a PRECIS-type management system of the keywords or descriptors.

Recommendation 15: That detailed analysis be done to determine the cost, procedures, and implications of a delivery system which makes use of the combined resources of FORMAT (National Film Board), PRECIS (University of Toronto), and the cataloguing services of UTLAS.

Recommendation 16: That the language of each description reflect the display language of the educational software.

Limited copies of the full report are available from the Planning & Research Branch of Alberta Education, 9th Floor, Devonian Building, 11160 Jasper Avenue, Edmonton, Alberta, T5K 0L2 (Telephone 403/427-2991).

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